

CHAPTER 11

PREVENTIVE MEDICINE

INTRODUCTION

In the Navy Department the maintenance of all personnel in the highest possible state of health and physical readiness is the responsibility of the commanding officer. The commanding officer, in turn, looks to the Medical Department for advice, recommendations, and establishment of standards.

The old adage “An ounce of prevention is worth a pound of cure” is an excellent guide to modern preventive medicine practice and certainly holds true in the Navy, where we are interested in keeping a man on the job rather than on the sicklist.

No matter what duties hospital corpsmen are assigned to, a phase of their work will always be aimed at preventing injury and disease and maintaining the health of their shipmates. This chapter will familiarize you with the basics of preventive medicine and help you understand the principles of maintaining good health in everyday living.

PERSONAL HYGIENE

Because of the close living quarters in the Navy, particularly aboard ships, personal hygiene is of utmost importance. Disease or ill health can spread and rapidly affect an entire compartment or division in a short period.

Personal hygiene promotes health and prevents disease. Some military personnel tend to be lax in paying strict attention to their personal hygiene. As a corpsman you will be responsible for recognizing signs of neglect, either at sick call or in the performance of your duties as a Medical Department Representative (MDR) and petty officer. You must also be especially scrupulous in your own personal hygiene, both to set a good example and to prevent the direct acquisition or spread of illness from patient and to yourself.

Corpsmen are responsible for presenting health education training programs to the personnel of their unit. In addition to stressing the basics of personal hygiene, they must draw attention to proper foot care, exercise, nutrition, and sleep as important factors in maintaining good health.

BASICS OF PERSONAL HYGIENE

Uncleanliness or disagreeable odor will surely affect the morale of your shipmates. A daily bath or shower will assist in the prevention of body odor and is absolutely necessary to maintain cleanliness. The daily shower also aids in the prevention of common skin diseases. Shampoo the hair at least once weekly, using a commercial shampoo of your choice. The importance of washing your hands at appropriate times cannot be overemphasized. Always wash your hands with soap and water after using the toilet and before meals.

PROPER FOOT CARE

Proper foot care is a vital factor in the overall performance of personnel, both ashore and afloat. Remember the foot gear you were issued in boot camp? If the fit was not perfect, the following weeks were most unpleasant for you. Proper fitting of shoes and socks is just one aspect of the problem. In military exercises, especially ashore, the feet are exposed to tremendous stress. The corpsman's job of monitoring foot conditions will be made easier if the unit's personnel have been taught to clean and dry their feet regularly, especially between the toes; to use foot powder to deter chafing and to promote absorption; to change socks and boots or shoes regularly, especially in wet environments; and to have foot disorders medically evaluated and treated promptly to prevent potentially disabling problems.

PROPER EXERCISE

Proper exercise increases the body's resistance to certain diseases, promotes its digestive and excretory function, and decreases one's risk for atherosclerotic heart disease (the nation's leading cause of premature death and disability). Improved muscle tone and physical endurance help the individual to fulfill military tasks and raise the level of self-confidence as well as improve the psychological disposition. Working outside in the fresh air enhances the value of exercise and

hastens acclimatization to new environments. Smoking and overindulgence in food and drink are detrimental and defeat the purpose of exercise.

PROPER SLEEP

During sleep the body recharges its nervous energy, repairs damaged cells, and regains its bounce. It is important to sleep undisturbed at regular hours and long enough to awaken refreshed. Continued physical and mental fatigue is detrimental to the maintenance of good health.

PROPER NUTRITION

Proper nutrition is essential to supplying the body with all the elements it needs to function. Energy for activity and proteins, minerals, and vitamins for growth are all supplied by a proper diet.

IMMUNIZATION

Protection of Navy and Marine Corps personnel against certain diseases before exposure to infection is called prophylactic immunization. Prophylactic immunization is limited to diseases that are very serious and for which effective and reliable immunizing agents have been developed.

While unit commanding officers are responsible for ensuring that all military and nonmilitary personnel under their jurisdictions receive the required immunizations and that appropriate records of such immunizations are maintained, the actual performance of these tasks is the responsibility of the Medical Department. (See BUMEDINST 6230.1 series, NAVMEDCOM-NOTE 6230, Immunization Requirements (latest issuance), and other appropriate guidelines.)

PRESERVATION AND DISPOSITION OF BIOLOGICAL

Store and distribute the yellow fever vaccine at temperatures below 0°C (32°F). The oral poliovirus vaccine requires particular care to preserve its potency. Storage should be in the frozen state at a temperature of -14°C (7°F). Thawing or evidence of thawing during shipment renders the shipment unacceptable for use. Store all other biological at temperatures between 20 and 8°C (35.6° to 46.4°F), and make sure they do not freeze.

Do not accept shipments for use if there is a change in the physical appearance or evidence suggestive of bacterial contamination or growth. Such shipments will be withheld from issue and use. Forward a request for disposition instructions to the supply source and an information copy to NAVMEDCOM, citing identifying data, circumstances, and deficiencies noted.

Empty containers of all living vaccines should be handled as infectious wastes. Before these items are discarded, they should be burned, boiled, or autoclaved.

Do not use immunizing agents beyond the stated expiration dates, unless an extension is specifically authorized by NAVMEDCOM and DPSC.

VACCINATION PRECAUTIONS

Before injecting a biological product, determine whether the individual has previously shown an unusual degree of sensitivity to a foreign protein. Individuals who give a history of sensitivity to an immunizing agent usually will be exempted from the immunization by a medical officer. Persons with a significant allergy to eggs or fowl should not be given vaccines prepared by cultivation in eggs (e.g., typhus, influenza, yellow fever, or measles vaccines). Record severe individual reactions or sensitivities to any biological agent or drug in the immunization record, indicating the offending substance, its lot number and manufacturer, the date administered, and the severity of the reaction. In addition, note any hypersensitivity to drugs or chemicals known to exist on a separate SF 600.

Prior to the administration of any immunizing agent, make provisions for immediate first aid and medical care of any anaphylactoid reaction that may occur. A military or civilian member of the Medical Department who is certified in emergency resuscitative techniques shall be present. An emergency tray containing material for immediate treatment of serious anaphylactic reactions, including a tourniquet and syringe containing a 1:1,000 aqueous solution of epinephrine, should also be on hand. Consult NAVMED 1-5052-15 series and local guidelines for other recommended materials and additional information regarding medical emergencies.

In severe reactions, symptoms appear immediately. These can include blotchy redness and hives of the skin; a feeling of a tight throat, bronchospasm, and dyspnea; vomiting, nausea and abdominal pain; rapid pulse; and the patient

feeling very apprehensive and possibly disoriented. The lips, tongue, and eyelids may be swollen; circulatory and respiratory collapse can occur. Treatment must be rapid and exact to stop the progress of shock. Immediately give 0.5 ml of epinephrine 1:1,000 subcutaneously (SC) in any available area without stopping to prepare the immunization injection site. Put a tight tourniquet proximal to the injection site (on the side toward the heart) to prevent further absorption of the material. Start an intravenous infusion using a 5 percent dextrose/saline solution so that access is available for other medications if needed. Make sure the patient is under a physician's care as rapidly as possible.

Whenever you notice local or constitutional reactions of unexpected severity or frequency, local infection, abscess formation not traceable to errors in techniques of administration, or other significant manifestations that may be due to the use of a biological product, discontinue administration of the lot and request instructions regarding the disposition of the suspected materials. Until you receive a reply, keep all open and unopened packages in the lot under proper storage conditions.

Precaution: Before administering any live virus vaccine to a female, except the oral poliovirus vaccine, ask her if there is any chance that she may be pregnant. If her answer is affirmative, a medical officer will probably grant a temporary exemption, since live virus vaccines are contraindicated during pregnancy.

For further information on waivers and exemptions, consult NAVMED P-5052-15 series, NAVMEDCOMNOTE 6320 (latest issuance), and BUMEDINST 6230.1 series.

Aircrew members shall not fly for a minimum of 12 hours (preferable 24 hours) after receiving any immunization except the oral poliovirus and smallpox vaccines.

INTERVALS

The prescribed time intervals between individual doses of a basic immunization series will be regarded as optimal and will be adhered to as closely as possible. If delays prevent completion of a series within the prescribed time, administer the next dose, or doses, at the earliest opportunity. A new series will not be given. Minimum intervals between doses will not be reduced under any circumstances. When a basic series has been completed, as evidenced by proper entries on an

official immunization record, the need for another basic series of the agent is eliminated. A single stimulating (booster) dose will suffice. There should be a minimum period of 30 days between doses of different live virus vaccines, unless a medical officer directs otherwise.

ROUTINE IMMUNIZATIONS

Manufacturer's inserts in the vial packages will specify the route of administration of the vaccine, e.g., intramuscularly (IM) or subcutaneously (SC). These directions must be followed accordingly.

Do not mix two or more immunizing agents in a vial or syringe for the purpose of permitting a single simultaneous injection; the agents may be biologically or physically incompatible. Always read the package insert before administering any immunizing agent.

When there is insufficient time to permit completion of a required basic series prior to travel, do not delay travel for any dose except the first dose of the series.

Smallpox Vaccine

The naturally occurring disease smallpox has been eradicated around the world. Thus, routine periodic vaccination of military personnel is currently no longer justified. Navy and Marine Corps personnel will be immunized for smallpox only in certain situations when they can be isolated from the general population. Current policy thus limits the administration of the smallpox immunization to the period of time during recruit training and officer indoctrination programs.

METHOD.— To avoid a large lesion with the increased danger of secondary infections, inject the virus by the multiple pressure method (do not cause bleeding) into as small an area as possible. The area should not cover more than one-eighth of an inch in any direction. To avoid infection, use aseptic technique. Cleanse the area with sterile cotton and alcohol or acetone, and permit it to dry thoroughly prior to vaccination. Failure to wait for the antiseptic to dry may result in inactivation of the virus. Allow the vaccine to dry for 3 to 5 minutes without exposure to sunlight, when wipe off the excess with sterile cotton or gauze. A specifically equipped jet injection gun may also

be used by trained personnel. Inspect the vaccination site 6 to 8 days after vaccination and interpret the response as follows:

1. A primary vaccination, if successful, shows a typical vesicle. If none is observed, check the vaccination procedures and repeat the vaccination with another lot of vaccine until a successful result is obtained. Record reactions as successful or unsuccessful.
2. Following revaccination, two possible responses may be noted:
 - Major reaction—A vesicular or pustular lesion, or an area of definite palpable induration or congestion surrounding a central lesion, which may crust or ulcer. This reaction indicates that virus multiplication has most likely taken place and that the revaccination is successful.
 - Equivocal reaction—Any other reaction should be regarded as equivocal. These responses may be the consequence of immunity adequate to suppress virus multiplication or may represent only allergic reactions to an inactive vaccine. If an equivocal reaction is observed, recheck the revaccination procedures and repeat the revaccination one time.

Typhoid Vaccine (killed and dried with acetone)

The typhoid vaccine consists of one 0.5 ml dose which is given subcutaneously. The vaccine will be administered to all active duty personnel at their first permanent duty station. Alert Forces will be revaccinated every 3 years. Never give the typhoid vaccine intradermally.

Tetanus-Diphtheria Toxoid

The basic series consists of two 0.5 ml primary injections, given intramuscularly 1 to 2 months apart. A third reinforcing injection of 0.1 ml is given approximately 12 months after the second dose when there is reliable evidence that the person has never received the immunization prior to entering the service. Reimmunization is required every 10 years or may be ordered after a serious injury or burn.

Trivalent Oral Poliovirus Vaccine

This live trivalent vaccine is given orally either in distilled unchlorinated water, in simple syrup, or by a sterile medicine dropper. Keep the vaccine frozen until needed and use only for 7 days after the bottle is opened. Never refreeze the vaccine. Give a single dose of trivalent oral poliovirus vaccine to all recruits or officers who have not had it within 3 days of recruit training or during officer indoctrination programs.

Influenza Vaccine

The influenza virus vaccine must be given annually, at the start of the respiratory disease season (usually October in the northern hemisphere), to all recruits, officer candidates, midshipmen, and members of the Navy and Marine Corps. The vaccine is sometimes offered to other personnel and dependents on a voluntary basis. All active duty Navy and Marine Corps personnel are designated to receive the immunization. Unless otherwise specified, give one injection of 0.5 ml intramuscularly.

Yellow Fever Vaccine

This vaccine is given to all Navy and Marine Corps Personnel and also to all other DOD personnel who must travel to a yellow fever endemic area. A single 0.5 ml injection is given subcutaneously. If the vaccine is received in concentrated form, it must be diluted in a 1:10 ratio. Reimmunization is required every 10 years.

Cholera Vaccine

This vaccine will only be given on a case by case basis to personnel who must travel to countries still requiring the vaccine. A 0.5 ml dose given either subcutaneously or intramuscularly is required. Reimmunization, if required, will be given at 6-month intervals.

Plague Vaccine

The basic series of plague vaccine consists of two doses. The first is 0.5 ml given intramuscularly and the second is 0.2 ml given intramuscularly 3 months after the first dose. This vaccine is given to all Navy personnel assigned to operational billets with the Fleet Marine Forces. It may be given under special circumstances in very high plague endemic areas or for high risk

occupational groups. Reimmunizations are given at 6-month intervals to all personnel who must travel to or reside in a plague-infested areas.

SPECIAL IMMUNIZATIONS

Besides the routine immunizations given to personnel, you may be responsible for the administration of additional vaccines as determined by the Surgeon General.

Measles and Rubella Vaccines

Administer the measles-rubella vaccine, or measles or rubella vaccine(s), to all male recruits early in recruit processing or training. It is permissible to wait for the results of rubella or measles antibody titers prior to administering the appropriate vaccine(s) to susceptible individuals only, provided that a reliable screening test is used and provided that such susceptibility testing does not unduly delay vaccine administration. Such susceptibility testing is not mandatory for male recruits and should be done only where practical and cost-effective. Female recruits will be asked about possible pregnancy and will undergo rubella antibody testing and a screening test for pregnancy prior to administration of any vaccine containing the rubella antigen. The measles-rubella vaccine, or measles or rubella vaccine(s) will be subsequently administered to susceptible individuals only. Administer the rubella vaccine to all susceptible persons engaged in health care, regardless of age or sex. Demonstrated rubella titers or a documented history of prior receipt of the rubella vaccine or the measles-mumps-rubella vaccine is adequate evidence of immunity for such individuals, regardless of age or sex. Potentially pregnant females will be asked about possible pregnancy prior to administration of the rubella vaccine.

Mumps Vaccine

Administer the mumps vaccine in dosages as recommended by the manufacturer to all probably susceptible persons engaged in health care. A previous history of mumps or a documented history of prior receipt of the live virus mumps vaccine or the measlesmumps-rubella vaccine is adequate evidence of immunity for such individuals. Institute this policy in health care settings for all probably susceptible personnel, regardless of age or sex. Ask potentially pregnant females about possible pregnancy prior to administration of the mumps vaccine.

Human Diploid Cell Rabies Vaccine

Individuals in occupational groups at high risk for contact with potentially rabid animals or laboratory specimens potentially contaminated with the rabies virus should receive the human diploid cell rabies vaccine (individual booster doses) in a regimen as recommended by the Advisory Committee on Immunization Practices (ACIP) and the manufacturer. Individuals who have received this regimen still require the post-exposure human diploid cell rabies vaccine prophylaxis in conjunction with appropriate rabies immune globulin, in accordance with the most current recommendations of the ACIP and the manufacturer.

Hepatitis B Virus Vaccine

The hepatitis B virus vaccine should be administered to individuals in "high risk" situations characterized by frequent contact with human blood or blood products (usually associated with certain health care occupational specialties). The dosage regimen consists of three doses of 1.0 ml each, administered intramuscularly; the second dose is given 1 month after the first dose, and the third dose is given 6 months after the first dose.

Adenovirus 4/7 Vaccine

Administer adenovirus 4/7 vaccines to all male recruits within the first 3 days of recruit processing or training. If epidemiologically indicated, and as recommended by the cognizant area Navy Environmental and Preventive Medicine Unit, adenovirus 4/7 vaccines may be administered to nonpregnant female recruits and to student officers in some settings. However, there is no current epidemiologic evidence to suggest that these vaccines are routinely needed in most settings outside the recruit center. NOTE: Current (1987) military policy mandates testing of all recruit populations for the presence of the antibody to the HIV (HTLV-3) virus, which is associated with the acquired immune deficiency disease (AIDS). Because there is concern that live virus vaccines may adversely affect recruit individuals who unknowingly have an altered or decreased immune system, it is current policy that any live virus vaccine, with the exception of adenovirus, will not be administered to recruits until the results of the HIV antibody testing are known. These live virus vaccines include those against yellow fever, measles, rubella, polio, and smallpox. As a result

of this policy, immunization schedules in Navy and Marine Corps recruit centers and officer indoctrination centers have had to be altered from previous long-standing recommendations.

RECORD OF IMMUNIZATIONS

The yellow PHS Form 731 is prepared for each member of the Armed Forces. Enter the data by hand, rubber stamp, or typewriter. The day, month, and year of each immunization given will be expressed in this order. Indicate the day in Arabic numerals; the month spelled out or abbreviated, using the first three letters of the word; and the year expressed in arabic numerals, either by four digits or by the last two digits. The member's Social Security number must be listed for identification purposes. Entries for smallpox vaccines should indicate whether freeze-dried or liquid vaccine was used. Make sure the origin and batch number are recorded for yellow fever and smallpox vaccines. Entries for smallpox, yellow fever, and cholera must be authenticated by the DOD Immunization Stamp and the actual signature of the medical officer or a specifically designated representative. All other immunizations are authenticated by initialing. Entries for tetanus toxoid alone will be recorded as "TT." Entries based on prior official records will have the following statement added: "Transcribed from official United States Department of Defense records." Such entries in the case of smallpox, yellow fever, and cholera shall be validated by the signature of a medical officer or a specifically designated representative.

An Immunization Record, SF 601, will be started for all personnel entering the Navy. It will be prepared in accordance with chapter 16 of the *Manual of the Medical Department* and will contain the Social Security number of the member for identification purposes.

COMMUNICABLE DISEASES

Communicable diseases, as the name implies, are those diseases that can be transmitted from one host to another. They may be transmitted directly or indirectly to a well person from an infected person or animal, or through the agency of an intermediate animal host, vector, or inanimate object. The illnesses produced result from infectious agents invading and multiplying in the host, or from their toxins (poisons).

TRANSMISSION OF INFECTIOUS AGENTS

Any means that brings an infectious agent to a susceptible human host and results in an exposure to the agent is a method of transmission. Essentially, there are two types of transmission, direct and indirect.

1. DIRECT TRANSMISSION—The transfer, without delay, of an infectious agent to a point (portal of entry) on a receptive host where it can enter the body. Examples of direct transmission are:
 - a. Direct contact—Touching, kissing, or sexual intercourse.
 - b. Direct projection—Droplet spray from coughing, spitting, talking, etc.
 - c. Direct exposure—The contact of susceptible tissue with soil, vegetable matter, etc., containing infectious agents.
2. INDIRECT TRANSMISSION—Examples of the three types are listed below.
 - a. Vehicle-borne—Infectious agents are transferred and deposited on a host at a suitable point of entry by fomites (nonliving, inanimate materials or objects, e.g., toys, bedding, utensils, food, and drink). The infectious agents must be present on the fomite; it may or may not have reproduced.
 - b. Vector-borne—Infectious agents are transferred to a susceptible host by insects. There are two types of vector-borne transmission.
 - (1) Mechanical—The infectious agent is acquired when an insect's body parts come into contact with contaminated materials, objects, or infected persons, and then make contact with a susceptible host.
 - (2) Biological—The infectious agent, after being acquired by an insect, must go through biological changes in the insect before it is capable of producing an infection or disease when deposited on or in a susceptible host.
 - c. Airborne—There are two methods of indirect airborne transmission, by droplet nuclei (from cough or sneeze) and dust. In both cases, the infectious agent may remain airborne for long periods of time.

REPORTING OF COMMUNICABLE DISEASES

An important step in the control of communicable disease is proper reporting. Instructions and requirements for reporting to local, state, national, and international health authorities are found in the preface of *Control of Communicable Diseases in Man* (NAVMED P-5038). In addition, cases in the Navy and Marine Corps must be reported as required by NAVMEDCOMINST 6220.2 series, Disease Alert Reports.

Navy references concerning prevention, control, diagnosis, treatment, etc., include *Control of Communicable Diseases in Man* (NAVMED P-5038), *Technical Information Manual for Medical Corps Officers* (NAVMED P-5052), and *Manual of Naval Preventive Medicine* (NAVMED P-5010). Selected communicable diseases are discussed in NAVMEDCOM/BUMED instructions.

Assistance with communicable disease investigation, reporting, and prevention may be obtained by contacting the area Navy Environmental and Preventive Medicine Unit.

Disease Alert Reports

The Disease Alert Report provides responsible commands with information necessary to minimize interruption of Navy and Marine Corps operations and to protect the health of personnel in the communities and areas in which they live. These reports are particularly applicable for reporting outbreaks of selected diseases that may affect operational readiness; be hazardous to the community; be spread through transfer of personnel; be an international quarantinable disease; or be of such significance that inquiry may be made of the Naval Medical Command or higher authority.

The initial Disease Alert Report will be submitted by the commanding officer with primary responsibility for the health and welfare of the affected individual. These reports are submitted either by speedletter or routine message. However, for all diagnoses indicated by an asterisk (*) in NAVMEDCOMINST 6220.2, or if, in the judgment of the commanding officer, more timely notification of the diagnosis is necessary to ensure expeditious implementation of preventive measures, submit a priority message. For more detailed information, refer to NAVMEDCOMINST 6220.2 series.

COMMUNICABLE DISEASES OF INTERNATIONAL IMPORTANCE

Acquired Immune Deficiency Syndrome (AIDS)

The onset of AIDS is gradual and presents symptoms that are nonspecific, e.g., fatigue, fever, chronic diarrhea, loss of appetite, weight loss, and involvement of the lymph nodes. Underlying deficiency of the body's immune system allows for secondary "opportunistic" diseases (bacterial, viral, or parasitic secondary infections) to develop. On some occasions, the first presentation is a severe, life-threatening opportunistic disease. Detection of AIDS may depend on the surveillance of certain diseases, which may be predictive of a body immune deficiency in the absence of a known immune deficiency.

A serologic test for antibodies to the AIDS virus is available and is now used for screening for evidence of past or present infection among civilian and military personnel.

The infectious agent is a virus designated as either human immune virus (HIV), human T-lymphotropic virus, type III (HTLV-3), or lymphadenopathy-associated virus (LAV). These are considered to be the same virus. The reservoir is man. The incubation period is unknown; evidence suggests from 6 months to 5 years with an average of about 2 years for transfusion-associated cases.

Epidemiologic evidence indicates that AIDS is primarily transmitted by promiscuous sexual contact (especially homosexual intercourse), sharing unclean needles, through contaminated blood transfusions or blood products, and transplacental transfer. It also may occur with heterosexual contact with high risk populations, e.g., prostitutes in the United States and overseas. This is not to say that only these populations are at risk; all personnel who engage in sexual activity with an unknown partner are at some level of risk.

The period of communicability for AIDS is unknown. It may extend from the asymptomatic period until the appearance of opportunistic diseases.

There is no specific treatment for the immune deficiency. Treatment is directed toward the opportunistic diseases that result from AIDS. Patients are treated in hospitals with blood and body fluid precautions. They require intensive medical support and prognosis for long-term survival is poor.

Preventive measures are very important. Educate personnel that having promiscuous sexual behavior and multiple random sexual partners increases the probability of contacting AIDS.

Personnel who are asymptomatic of AIDS but antibody positive should not donate blood, should not be sexually promiscuous, and should be intensively counseled about what this condition means.

Amebiasis

This intestinal infection may be asymptomatic; however, symptoms can include mild abdominal discomfort, chills, fever, diarrhea with blood or mucus, and abscesses of the liver, lung, or brain. The diagnosis is established by microscopic observation of cysts or trophozoites in fresh or preserved stool specimens or by aspirate from abscesses or tissue. The disease occurs worldwide, but is more common in areas with poor sanitation and health education.

The infectious agent is the single-celled intestinal parasite *Entamoeba histolytica*. The reservoir is an infected person, usually an asymptomatic cyst passer. Outbreaks are usually spread by the soiled hands of food handlers, contaminated water, hand-to-mouth transfer of feces, flies, and contaminated fruits and vegetables. Patients with acute dysentery are not very communicable, as they do not pass cysts in their stools and any trophozoites passed are fragile. The average incubation period is 2 to 4 weeks. Amebiasis is communicable as long as cysts are passed in the stool, sometimes for years. Treatment is with specific antiparasitic drugs.

Preventive measures require (1) sanitary disposal of human feces from patients; (2) proper surveillance and protection of public water systems to prevent fecal contamination (filtration of large water systems; iodine treatment or boiling of small water supplies); (3) education of food handlers and the general public in personal hygiene, particularly handwashing after defecation and before eating or preparing food; (4) control of fly populations with approved insecticides, sanitary disposal of garbage, and preventing access to food by screening; (5) soaking raw fruits and vegetables in approved disinfecting solutions before eating; and (6) indoctrinating known carriers concerning methods to prevent transmission, e.g., washing hands well after defecation.

Management of patients, contacts, and the nearby environment requires (1) isolation of patients with enteric precautions and exclusion of

persons with symptoms from food handling or patient care duties; (2) proper disposal of patient feces; and (3) epidemiologic investigation for methods of transmission. (Household members and other close contacts should have stool specimens checked for *Entamoeba histolytica*.) There are no requirements for quarantine or immunization.

In populations with a large percentage of carriers, a failure of sanitary facilities (e.g., sewage disposal or water treatment) or improper food handling techniques could result in large outbreaks.

Botulism

Botulism is a serious condition caused by poisoning from a bacteria-produced toxin. The clinical course includes the initial symptoms of drooping eyelids, blurred or double vision, sore throat, dry mouth, vomiting, and diarrhea, which may be followed by symmetrical paralysis. There is no fever unless accompanied by an infection. The agent is a toxin produced by *Clostridium botulinum*.

A diagnosis is made by identification of the toxin in the patient's stool or serum. The presence of the specific toxin in suspected food supports this diagnosis. Outbreaks of botulism occur worldwide and are usually traced to food preservation techniques, where the spores of *Clostridium botulinum* are not destroyed in the process. Cases almost never result from consumption of commercially processed foods.

The reservoir is the intestinal tract of animals and fish, soil, and marine sediment. Botulism is thus acquired by eating food containing the toxin of *Clostridium botulinum*. The incubation period averages about 24 hours. Botulism is not communicable from man to man. Treatment is primarily with an intravenous or intramuscular injection of trivalent botulinal antitoxin.

Preventive measures include (1) surveillance of commercial food processing plants to ensure proper processing and preparation; (2) never consuming or "taste testing" commercially prepared food in deformed containers or with "off-odors"; (3) purchasing of food for the use of the Navy and Marine Corps from establishments listed in the *Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement*; and (4) education of persons who can food at home concerning time, pressure, and temperature requirements to kill spores of *Clostridium botulinum*.

Management of patients, contacts, and the nearby environment includes (1) boiling or disinfecting food and utensils containing toxin with chlorine to destroy the toxin; (2) evaluation of contacts (those who have eaten food containing the toxin) by a medical officer; and (3) investigation of the most recent food consumed by patients affected and recovering suspected food for testing and proper disposal. There is no requirement for quarantine.

If a single case is suspected, immediately consider a group outbreak which involves a family or other group who shared the common food. Home canned foods should be considered first. If it is determined that a commercial food product is involved, an immediate recall is indicated. NAVSUPINST 10110.8 series outlines procedures to be taken by Navy and Marine Corps food service facilities.

Chickenpox— Herpes Zoster (Varicella—Shingles)

Chickenpox is an acute generalized viral disease with sudden onset, low grade fever, and mild constitutional symptoms. It begins with a maculopapular rash and rapidly progresses to characteristic vesicles that remain for 3 to 4 days and form scabs.

Usually more lesions appear on skin covered by clothing and in the hair than on uncovered skin. New lesions appear through the course of the disease; therefore, all stages of the lesions may be present at the same time. Occasionally adults develop severe constitutional symptoms and fever. Deaths are rare for both adults and children.

Herpes zoster is a later attack from the same infectious agent which may have remained latent in the body for many years. It is characterized by lesions similar to those of clinical chickenpox; however, they appear on the body in a distribution pattern supplied by sensory nerves or dorsal root ganglia. The lesions are usually unilateral, deeper, and more numerous than with chickenpox. Severe pain and a prickling, tingling or creeping sensation of the skin is common. Zoster occurs much more frequently in adults; however, some children are affected, especially those who experienced chickenpox prior to 2 years of age and those under treatment for cancer.

Diagnosis is usually established by clinical examination. Occurrence is worldwide. The infectious agent is the varicellazoster virus. Man is the reservoir.

Chickenpox is readily transmitted from man to man by direct contact, droplet and airborne respiratory secretions, fluid from vesicles (including cases of zoster) and freshly contaminated fomites. Contacts infected by zoster develop chickenpox. The incubation period is usually 2 to 3 weeks. The patient is communicable for 1 to 5 days prior to the onset of the rash and for about 6 days from the occurrence of vesicles. All persons not previously having the disease are susceptible. The first infection gives lifelong immunity. Treatment is symptomatic.

Preventive measures include (1) protecting high-risk individuals from exposure; and (2) administering Varicella-Zoster Immune Globulin to immunosuppressed patients which will modify or prevent the disease when given within 4 days of the exposure.

Management of patients, contacts, and the nearby environment requires (1) exclusion of children from school for 7 days after the appearance of the rash; (2) strict isolation when patients are hospitalized to protect susceptible immunocompromised patients; (3) concurrent disinfection of fomites soiled by discharges from the nose, throat, and lesions of patients; and (4) quarantine from 7 to 21 days after exposure could be justified to protect immunologically compromised patients in hospitals. Epidemic measures are not necessary. However, when large numbers of children are crowded in conditions such as emergency housing, large outbreaks may occur.

Cholera

Cholera is an acute bacterial intestinal infection. Signs and symptoms are sudden and include vomiting, large quantities of watery stools, dehydration, and circulatory failure. In serious cases with no treatment, the mortality rate may be much greater than 50 percent and fatalities may occur within a few hours of the onset of illness. With proper medical care, the mortality rate can be very low.

Historically it is endemic in parts of Asia. In recent years, endemic areas have expanded to include Eastern Europe and Africa. Sporadic cases occur among U.S. travelers coming from all parts of the world.

The infectious agent is *Vibrio cholerae*. The reservoir is man. The major method of transmission is drinking water contaminated with excretions of patients. Other avenues are from contaminated food (including raw seafood from

polluted water), and eating food prepared/served with unwashed hands. The average incubation period is 2 to 3 days. It is communicable during the period when the stool is positive for *Vibrio cholerae*; this period continues for a few days after recovery. Patients who develop into carriers may be communicable for several months.

The primary treatment is with the administration of large amounts of oral or intravenous fluids. Antibiotics given at the direction of a medical officer may be helpful in reducing the duration and severity of diarrhea and fluid loss.

Preventive measures for control of the disease include (1) proper disposal of human feces; (2) providing clean drinking water and water treatment and disinfection; and (3) emphasizing good personal hygiene, especially handwashing before eating and after using the latrine.

Management of patients, contacts, and the nearby environment requires (1) isolation of patients by enteric (gastrointestinal) precautions, e.g., handwashing and disposal of intestinal excretions; (2) observing contacts of patients for symptoms 5 days from the last exposure (antibiotic prophylaxis and immunization are not routinely recommended); and (3) conducting an investigation for the source of the infection. There is no requirement for quarantine.

Epidemic control entails (1) providing clean potable water and sanitary sewage disposal; (2) identifying the location of the source of infection and appropriate control methods; and (3) ensuring sanitary food handling.

There are some international requirements. Ships and aircraft arriving from cholera areas must follow procedures outlined in International Health Regulations; details are found in SECNAVINST 6210.2. Except for a few specified countries, immunization is not required for international travel.

Dengue Fever (Breakbone fever)

Dengue fever is characterized by a sudden onset of fever (occasionally lasting 7 days or more), intense headache, pain behind the eyes, joint and muscle pain, and a rash. There is early redness of the skin in some patients; usually for 3 to 4 days after the beginning of fever, a rash presents with small discolored raised spots or closely aggregated bright red points. Minute hemorrhagic or purpuric spots may appear on the feet, legs, axillae, or palate at about the same time the temperature returns to normal. Patients with dark skin often have no visible rash.

The infectious agents are the viruses of dengue fever (types 1, 2, 3, and 4). These viruses also cause dengue hemorrhagic fever (discussed later). The reservoir is either man-mosquito or monkey-mosquito, depending on the geographic area. Dengue is endemic to tropical Asia, West Africa, parts of the Caribbean, and several countries in Central and South America.

The virus is transmitted to man by the bite of mosquitoes belonging to the genus *Aedes*. Mosquitoes acquire the virus by biting man and, in some areas, monkeys. The incubation period is usually 5 to 6 days. Patients are normally infective to mosquitoes 24 hours before the onset until the fifth day of the disease. Treatment is supportive; there are no specific antibiotics.

Preventive measures require (1) implementing mosquito surveys in affected communities to determine the density of vector mosquitoes, identifying breeding places, and eliminating the vectors where practical; and (2) making information available to the public concerning methods for protection from the vector mosquito bites such as the use of repellents, screening, and bed nets.

Management of patients, contacts, and the nearby environment includes (1) precautions with patient blood by denying mosquitoes access to the patient for at least 5 days after attack by using screens, an approved residual insecticide, or by the use of bed nets; and (2) investigation of a case including the place of residence at the time of infection (3 to 15 days prior to the onset) and search for unreported or undiagnosed cases. There is no requirement for quarantine or immunization.

Epidemic measures, when necessary, include (1) surveying, locating, and eliminating all manmade *Aedes* mosquito breeding places; (2) encouraging all persons who are occupationally exposed to the vectors to use repellents; and (3) air dispersal of approved insecticides to stop epidemics.

International measures require strict enforcement of all existing international agreements designated to prevent the spread of this disease by man, monkey, and mosquitoes via ships, airplanes, and land transportation from endemic areas.

Dengue Hemorrhagic Fever

This severe illness affects primarily children, but cases can be seen in adults. Symptoms and signs include circulatory shock, high fever, loss of appetite, vomiting, headache, and abdominal pain. A hemorrhagic phenomenon is seen, which

includes excessive bleeding at venipuncture sites, the nose, and gums. Tissue is easily bruised. In some patients, after a few days of fever, their condition deteriorates into sudden shock (known as the dengue shock syndrome) with blotchy cool skin, cyanosis around the mouth, rapid pulse, and abnormally low blood pressure. In untreated cases of the dengue shock syndrome, the fatality may be as high as 40 to 50 percent.

Outbreaks of dengue hemorrhagic fever have been reported throughout Southeast Asia and Cuba. The occurrence is during the wet season when the *Aedes aegypti* population is highest. About a third of all deaths are under 15 years of age. This disease primarily affects the indigenous population.

The infectious agent is the dengue virus (types 1, 2, 3, and 4). The reservoir is *Aedes aegypti* mosquito and man, and it is transmitted by a mosquito bite. The disease is believed to occur by an immunological reaction from a second or subsequent infection with the dengue virus. See the Dengue Fever section for method of control.

Giardiasis

Giardiasis is a parasitic infection of the small intestine. Symptoms may include chronic diarrhea, excess fat in the stools, abdominal cramps, bloating, frequent loose pale stools, fatigue, and weight loss. The diagnosis is established by identification of cysts or trophozoites in feces.

Giardiasis occurs worldwide and in children more often than in adults. More cases occur in areas with poor sanitation, in institutions, and in day-care centers. Waterborne outbreaks have been frequently seen in the United States.

The infectious agent is *Giardia lamblia*, a protozoa. Reservoirs include man, beavers, and other wild or domestic animals.

Local outbreaks occur when the cysts are ingested with contaminated water and less often in fecally contaminated food. Transmission may occur from person to person by the fecal-oral route in day-care centers.

The incubation period ranges from 5 to 25 days. Giardiasis is communicable during the period of infection; undiagnosed carrier states are common. Treat the infection as directed by a medical officer. Quinacrine hydrochloride (Atabrine) or metronidazole (Flagyl) are drugs of choice.

Preventive measures for control include (1) filtering of public water supplies suspected to be at risk from human or animal fecal contamination; (2) ensuring that families, inmates, and personnel

concerned with institutions and day-care centers receive training in personal hygiene after defecation; and (3) ensuring that emergency water supplies taken from suspected sources are boiled or treated with chlorine or iodine.

Management of patients, contacts, and the nearby environment include (1) enteric precautions for patients and (2) investigating contacts and the environment for the source of infections. There is no requirement for quarantine.

Epidemic measures include investigating cases to determine a common source, such as water, food, or direct contact, and instituting measures to prevent transmission.

Viral Hepatitis

Several different illnesses are considered as viral hepatitis; they have similarities and differences. This section will discuss the two major types.

VIRAL HEPATITIS A.— The onset is gradual over several days with symptoms of fever, malaise, loss of appetite, nausea, abdominal discomfort, and, a few days later, jaundice. The course of this disease varies from the commonly seen mild form (lasting for 1 to 2 weeks) to the uncommonly seen severe form (lasting several months). A convalescence of several weeks can be expected. Complete recovery without sequelae can be expected. Many cases are mildly symptomatic with no jaundice. Viral hepatitis A occurs worldwide in epidemics and is endemic in many developing countries. Many outbreaks occur in institutions, housing areas, and in military forces. This disease is more common in school-age children and young adults.

The infectious agent is the hepatitis A virus. The reservoir is man. The average incubation period is about 28 to 30 days, but it will range from 15 to 50 days, depending on the virus dosage received.

Transmission is from person to person by the fecal-oral route. Hepatitis A virus is at the highest levels in feces 1 to 2 weeks before the symptoms occur and decreases rapidly after the onset of jaundice. Many outbreaks are spread by food and water. Raw or under-cooked clams and oysters have been incriminated. Viral hepatitis A appears to be most communicable during the 2 weeks before the symptoms occur and is probably not transmitted after the first week of illness. There is no specific treatment, except for supportive measures.

Preventive measures includes (1) education of the public (especially food handlers and preparation personnel) concerning personal hygiene and good sanitation, e.g., good handwashing and sanitary disposal of human feces; and (2) stressing handwashing among the staff after each diaper change in child care centers. If one or more cases occur, consider giving immune globulin to the staff, to other children who attend, and to the families of children attending.

Also, travelers to highly endemic areas who plan to remain for up to 3 months may be given human immune globulin in a dose of 0.2 to 0.4 ml/kg of body weight (or 2 ml total for adults). For continued long-term exposure, 0.6 ml/kg of body weight (5 ml total for adults) may be given; it should be given every 4 to 6 months while in the area. At this time a vaccine specifically against hepatitis A is not available for general use.

Management of patients, contacts, and nearby environment includes (1) isolation of patients with enteric precautions for the first 2 weeks of illness; (2) passive immunization with human immune globulin for usually only household and sexual contacts (intimate contacts); and (3) investigation of contacts to include a search for missed cases, a search for a common source, and a surveillance of household or close contacts. There are no requirements for quarantine.

When necessary during epidemics, several measures are required. An investigation should be conducted to determine the method of transmission and to identify the population at risk of infection. If viral hepatitis A is diagnosed in a food handler, give human immune globulin to other food handlers in the facility. However, it is recommended that patrons not be immunized unless an infected food handler prepared foods that were not cooked, his or her personal hygiene was deficient, and human immune globulin can be given within 2 weeks of exposure to the index case. If necessary, sanitary practices should be improved to prevent fecal contamination of food and water. Mass administration of human immune globulin should be considered to control outbreaks in institutions. Epidemics of hepatitis A may be expected during disaster situations where large numbers of people are crowded together with poor sanitation and inadequate water supplies. If cases occur, it is recommended that efforts be made to improve sanitation and water supplies. Administration of human immune globulin cannot be recommended as a substitute for proper environmental health measures. There is no requirement for international measures.

VIRAL HEPATITIS B.— The onset progresses gradually. There is loss of appetite, slight abdominal discomfort, nausea, vomiting, joint pain, rash, and jaundice. Fever, if present, is usually mild. The severity of this disease ranges from inapparent cases to death due to severe hepatic injury.

The diagnosis can be confirmed by demonstration of a specific blood virus particle, the hepatitis B surface antigen (HBsAg), or the recent development of antibody to core and/or surface antigens (anti-HBc, anti-HBs, respectively). HBsAg can be found in the serum for several weeks before the appearance of symptoms and for weeks to months after the onset and remains present in chronic infections. The infectious agent is the hepatitis B virus. Man is the only recognized reservoir.

Although HBsAg is found in numerous body secretions/excretions, only blood, saliva, semen, and vaginal fluids have proven to be infectious. Transmission occurs by percutaneous inoculation (such as a needle stick) with infective body fluids or by sexual exposure. Human blood, plasma, serum, and other blood products may transmit the hepatitis B virus. Thus all blood products are screened in the laboratory for HBsAg. Contaminated needles, syringes, and other intravenous equipment are frequently involved in transmission, especially among drug abusers. The infection is also rarely spread through open wound contamination by blood or sera from another infected individual. The agent may also be transmitted by heterosexual and homosexual contact. The shared use of personal items, e.g., razors, and toothbrushes, has been implicated as a rare cause.

The average incubation period is from 60 to 90 days. Blood is infective several weeks before the first symptoms appear, during the acute clinical disease, and, in those cases that develop into the chronic carrier state, it may be infectious for years. There is no specific treatment except for supportive measures.

There are several preventive measures. Inactivated vaccines are now commercially available against viral hepatitis B. The vaccine is recommended for those persons who may come into contact with blood, persons who receive repeated blood transfusions or blood fractions, household contacts of carriers, the sexually promiscuous, staff in institutions for the retarded, hemodialysis patients, and illicit injectable drug users. Pregnancy is not necessarily a contraindication for immunization.

Pregnant women in high risk groups should be tested for the presence of HBsAg and, if positive,

their infants should receive postexposure prophylaxis (hepatitis B immune globulin and hepatitis B vaccine).

Strict testing discipline should be enforced in all blood banks. Donated blood should be tested for HBsAg. All donors should be rejected who have a history of viral hepatitis, present evidence of drug abuse, or received a blood transfusion or tattoo within the past 6 months. Unscreened blood or blood products are not administered to any patient unless an absolute emergency. Perform sterilization on all syringes, needles, acupuncture needles, and stylettes. The use of disposable equipment is recommended.

Management of patients, contacts, and nearby environment includes (1) isolation (inpatient and outpatient) with precautions for blood and body fluids until the disappearance of HBsAg and the appearance of anti-HBs; (2) concurrent disinfection for all equipment contaminated with blood, saliva, or semen; and (3) immunizing contacts with hepatitis B immune globulin, human immune globulin, or hepatitis B vaccine, as directed by a medical officer. It is very important to administer prophylaxis as soon as possible after exposure. There is no requirement for quarantine.

If the occurrence of two or more cases can be related to a common exposure, search for more cases. Enforce strict aseptic techniques. If blood derivatives are implicated, recall the lot and trace all persons who received the product, in search of additional cases. No international measures are required for hepatitis B patients or their contacts.

Influenza

Influenza is an acute viral disease primarily involving the respiratory tract with symptoms of fever, chills, headache, muscular pain, exhaustion, acute rhinitis, sore throat, and cough. Recovery is usually complete within 2 to 7 days. During large epidemics acute illnesses and deaths may be expected among the elderly and other patients with chronic medical disorders.

Influenza occurs worldwide as epidemics or localized outbreaks. Attack rates are about 15 to 25 percent in large communities and in isolated populations may be as high as 40 percent. The infectious agents are types A, B, and C influenza virus. Epidemics of type A occur in the United States approximately every 1 to 3 years; type B occurs every 3 to 4 years, with occasional mixed epidemics. Epidemics usually occur during the winter in temperate regions and in the tropics at

any season of the year. The reservoir for the influenza is man.

Influenza is transmitted most commonly by the airborne route through infective droplets from coughing, sneezing, and close talking, especially in crowded populations. The incubation period is very short, approximately 1 to 3 days. The period of communicability is approximately 3 days, beginning with the first clinical symptoms.

An attack gives immunity only to the specific type or subtype of the virus involved. Vaccines provide immunity to a particular virus and related strains to which an individual has been previously exposed.

Current policy requires that all active duty Navy and Marine Corps personnel receive the annual influenza vaccine.

Management of patients, contacts, and the nearby environment includes the following principles: Because there is a usual delay in establishing the diagnosis, many others can become infected. Therefore, it is usually not practical to isolate cases. It may be desirable to isolate infants and younger children by keeping them in the same room. No concurrent disinfecting is required. No quarantine is required. Investigation of contacts is of no value and is not recommended.

At the beginning of epidemics, it is important that preventive medicine personnel establish surveillance of epidemics to determine the extent and progress that community functions are affected.

Malaria

Early symptoms of the four different types of human malaras are similar. Laboratory studies are necessary for differential diagnosis. Falciparum malaria is the most serious type and usually has various symptoms of fever, chills, sweating, headache, jaundice, blood coagulation defects, shock, renal failure, liver failure, and disorientation and delirium. Prompt diagnosis and treatment of all malaras is essential; however, falciparum malaria, because of its severity, should be considered a medical emergency.

The other three types of malaras are not life threatening for healthy adults; however, the very young, the aged, and individuals with other diseases may be at serious risk. General symptoms for these malaras include an indefinite period of malaise, which is followed by chills, shaking, fast rising temperature, usually headache, nausea, and sweating. Symptoms are followed by a time period

with no fever and the cycle of chills, fever, and sweating is repeated each day, every other day, or every third day. If untreated, a primary attack continues from 1 week to more than a month.

The diagnosis can be established by the identification of malaria parasites in stained smears of patient blood on microscope slides (blood films). To find the parasites, it may be necessary to repeat the blood films.

Malaria occurs in many tropical and subtropical areas worldwide including Central and South America, Asia, and Africa.

The infectious agents for the human malarias are, *Plasmodium vivax*, *P. falciparum*, *P. malariae*, and *P. ovale*. Mixed infections frequently occur. Man is the reservoir for human malaria. Malaria is transmitted by the bite of the female Anopheles mosquito and by injection, blood transfusion, and contaminated needles and syringes.

The incubation period depends on the particular *Plasmodium* species, and it may range from days to months. Humans are infectious to mosquitoes as long as gametocytes are in their blood. The period of time that gametocytes are in the blood varies with the species, strain, and medication.

Preventive measures include (1) eliminating or reducing anopheline mosquito breeding places by draining or filling impounded water; (2) applying effective approved residual insecticide to surfaces where anopheline mosquitoes rest; (3) in endemic areas, spraying sleeping quarters with pyrethrum and/or using other approved insect repellents on exposed skin; (5) obtaining an accurate history of blood donors concerning malaria and possible malaria exposure before accepting blood; (6) locating and treating all acute and chronic cases of malaria that have occurred in the same area as the index case; and (7) practicing the regular use of chemosuppressive drugs in malarious areas. Chloroquine is the most commonly used drug for this,

Patients should be isolated by blood precautions. However, no concurrent disinfection measures are required. No quarantine measures are required and immunization of contacts is not applicable.

An increase in malaria cases may be expected with wars, other social upheavals, and any climatic changes that increase breeding areas for vectors in endemic regions.

International measures are extremely important. Aircraft, ships, and other transportation vehicles going into and coming out of malarious

and mosquito populated areas should be properly disinfected by health authorities. Finally, consider the use of antimalarial drugs when there is a mass movement of migrants from areas where malaria is endemic to malaria free areas.

Measles

Measles is an acute viral disease with signs and symptoms of fever, conjunctivitis, rhinitis, cough, and small irregular bright red spots with a bluish white center (Koplik's spots) located inside the mouth on the cheeks. A red blotchy rash characteristically begins on the face between the third and seventh day and then spreads to the trunk. Measles is most serious in adults and infants; otitis media, pneumonia, and encephalitis may occur as complications. In the United States and Canada, since the onset of childhood immunization programs, measles now occurs primarily in preschool children, adolescents, young adults, and those refusing vaccination. In temperate climates, most cases occur in late winter or early spring. In the tropics, most children acquire measles at an early age as soon as the maternal antibody lowers.

The infectious agent is the measles virus. Man is the reservoir. Measles is spread by nasal or throat secretions through droplets, direct contact, and less frequently by airborne methods or fomites. The incubation period averages about 10 days from exposure until the onset of fever and may vary from 8 to 13 days. The rash usually appears 14 days after exposure. Measles is communicable from just prior to the onset of fever to about 4 days after the appearance of the rash.

Susceptibility is general except for those persons who have recovered from the disease or those who have been immunized. Recovery usually gives permanent immunity. Infants whose mothers are immune are usually immune for the first 6 to 9 months of their lives.

There is no specific treatment for measles.

The primary preventive measure is vaccination with the live attenuated measles vaccine. It is recommended for all individuals susceptible to measles,

For patient management, isolation is not practical for an entire community; however, it is recommended that children be kept home from school until at least 4 days after the appearance of the rash. For hospitalized patients, practice respiratory isolation from the onset of fever until after the fourth day of rash to reduce exposure of other high risk patients.

During epidemics, the spread of measles can be limited with immunization programs to protect susceptible individuals. Measles may have a high fatality rate in underdeveloped populations, therefore, vaccines, if available, should be given early in an epidemic to limit the spread. If there is a shortage of vaccines, give young children the highest priority.

Meningococcal Meningitis

Meningococcal meningitis is a bacterial disease that has a sudden onset with symptoms of fever, severe headache, nausea and usually vomiting, stiff neck, and often a pinpoint red rash. Coma and delirium occur frequently. Occasional cases experience purplish patches caused by extravasation of blood into the skin, and shock at the onset of illness. It can be fatal without treatment. The diagnosis is established by the identification of bacterial organisms in a gram stain of spinal fluid or blood.

Meningococcal meningitis occurs in both tropical and temperate areas. Sporadic cases usually occur throughout the year in urban and rural areas with the greatest numbers occurring during the winter and spring. Epidemics may occur at irregular intervals. This is usually a disease of small children, but it can occur in young adults. In adults, it is more common in those recently introduced to crowded living conditions.

The infectious agent is the bacterium *Neisseria meningitidis*. The reservoir is man. Transmission is by direct contact, which includes droplets and discharges from the nose and throat of infected persons or asymptomatic carriers. About 25 percent of a population may be carriers with no actual disease cases. In military units during outbreaks, more than one-half of the unit may be asymptomatic carriers. The incubation period is normally for 3 to 4 days. Meningococcal meningitis is communicable as long as the organism is present in discharges from the nose and mouth.

Penicillin in adequate doses given parenterally remains the drug of choice.

Preventive measures are primarily based on the immunization of personnel who live in crowded conditions, e.g., military recruits.

For patients, respiratory isolation is required until 24 hours after chemotherapy is begun. There should be surveillance of household or other intimate contacts for early symptoms of meningitis, especially fever, so that early treatment can be started. Household or other intimate contacts may benefit from oral chemotherapy. Routine cultures

of contacts are not recommended because the results are not sensitive enough and are not completed promptly enough to effect the decision to give prophylaxis.

During community outbreaks, emphasis is placed on surveillance, early diagnosis, and treatment.

Mumps

Mumps is a viral disease with symptoms of fever, swelling, and tenderness of one or more of the salivary glands (usually the parotid gland(s)). Fifteen to 20 percent of adult males experience infection of the testicle. About 5 percent of females experience ovary infections; however, reproductive sterility is a rare sequel. Aseptic meningitis occurs frequently as a symptom of central nervous involvement. Females during the first trimester of pregnancy may experience an increase in the rate of spontaneous abortions. Deaths are rare.

The infectious agent is the mumps virus. The reservoir is man. Mumps is transmitted by direct contact with saliva or by droplet spread with saliva from an infected person. The incubation period is about 18 days. Mumps are most infectious about 38 hours prior to the onset of illness and probably communicable from 6 days prior to swelling and tenderness of the salivary glands until 9 days later. Asymptomatic cases may be communicable. Susceptibility is general. After a clinical case or asymptomatic infection, immunity is generally lifelong.

There is no specific treatment.

Preventive measures are based on a vaccine available as a single vaccine or combined with rubella and measles.

Patients isolated should be using respiratory precautions in a private room for 9 days after the onset of swelling and tenderness of salivary glands or until the swelling has subsided.

Pediculosis

Pediculosis is an infestation of lice on the body and/or clothing. Lice and eggs (nits) are usually found in body hair or the inside seams of clothing. An infestation results in extreme itching and abraded skin (from bites and scratching). Secondary skin infections and inflammation of the regional lymph nodes may occur. Crab lice normally infest the pubic area. However, they may infest other hairy areas, including facial hair and eyebrows. Pediculosis occurs worldwide.

Outbreaks are most common among children in schools or other institutions.

The infesting agents of pediculosis are *Phthirus pubis* (the crab louse), *Pediculus humanus capitis* (the head louse), and *P. humanus corporis* (the body louse). The reservoir is man. Head and body lice are most commonly transmitted by direct contact with an infested person. Body lice and less frequently head lice are also transmitted by indirect contact with the personal belongings of an infested person, e.g., clothing and headgear. Crab lice are most frequently transmitted through sexual contact.

Lice are heat sensitive organisms and will leave a host with fever. Transmission easily occurs from person to person under crowded conditions. With ideal conditions lice eggs hatch in 7 days and reach sexual maturity in 8 to 10 days. Pediculosis is communicable as long as lice or eggs remain on an infected person or clothing.

Lice may be treated with 1 percent gamma benzene hexachloride lotions (Lindane, Kwell). (It should not be used on infants, young children, or pregnant or lactating women.) Normally a second application 7 to 10 days later is recommended to treat any eggs that survived. Clothing and bedding may be disinfected by washing in hot water.

Plague

Plague is a disease of animals and man (zoonosis) that is transmitted by a flea bite from infected rodents to susceptible animals, including man. The first sign is usually an inflammation of lymph nodes (bubonic plague) in the inguinal, axillary, or cervical regions, depending on the location of the flea bite. Lymph nodes may form pus, and fever develops. Septicemia may develop and carry the disease to other organs or systems, including the membranes covering the brain. When the lungs are affected (pneumonic plague), the disease may be transmitted from man to man by direct respiratory contact (coughing, spitting) or direct projection and may result in outbreaks or epidemics. The fatality rate for bubonic plague may reach 50 percent. Without treatment, septicemic plague and pneumonic plague are usually fatal. The fatality rate of all types of plague may be reduced with prompt diagnosis and medical treatment.

Diagnosis may be established by observing plague organisms in gram stains, and cultures of material from a bubo, sputum, or spinal fluid.

The natural reservoir of plague is wild rodents, which can be in contact (and transmit their fleas) with domestic rats. Wild rodent plague has been found in many countries including those of North America, South America, the Middle East, Africa, Southeast Asia and Europe. In all areas of wild rodent plague, human plague can and does occur.

The infectious agent is *Yersinia pestis*. The reservoir is usually wild rodents, possibly rabbits, and larger carnivores. The incubation period is from 1 to 6 days.

With favorable weather, infected fleas may be communicable for several months. Pneumonic plague is easily transmitted from man to man under crowded conditions when susceptible persons are in close contact with cases. Persons who have recovered from plague may acquire the disease again with an additional exposure. Treatment with early antibiotic therapy (preferable within 8 hours and not later than 24 hours from the onset) is effective for pneumonic plague. There may be secondary infection. Bubos may require incision and drainage.

Preventing flea bites on humans and avoiding exposure of susceptible persons to pneumonic plague cases are the primary methods of control. Specific measures include (1) in endemic areas, establishing information programs to educate the public about infected rodents/fleas; (2) routine surveys of domestic and wild rodent populations to evaluate environmental control programs (e.g., poisoning and trapping programs) and the possibility of plague transmission from rodents to man; and (3) rodent and flea control in and around port facilities requiring additional steps, including the prevention of rat movement to and from ships (rat guards) and shipboard poisoning and fumigation.

Management of patients, contacts, and the nearby environment includes (1) disinfection and isolation of patient clothing and baggage; (2) ensuring that all persons exposed to pneumonic plague be isolated and placed on chemoprophylaxis with close surveillance for 7 days; (3) disinfestation of all contacts with bubonic plague patients and chemoprophylaxis for household contacts; (4) attempt to find all close contacts (e.g., household contacts and face-to-face contacts) exposed to pneumonic plague, as well as dead or dying rodents and their fleas; and (5) vaccination for persons living in high plague areas, laboratory workers, and field workers.

International measures stipulate that ships and aircraft arriving from plague areas must follow

procedures outlined in International Health Regulations. They must be rodent free or routinely deratted. Routine vaccination for plague is not required for international travel to almost all countries.

Poliomyelitis, Acute

Poliomyelitis (polio) is a serious viral disease with symptoms that may include fever, malaise, headache, vomiting, severe pain in muscles and spasms, stiff neck and back, and the paralysis that is characteristic of the disease. The virus multiplies in the alimentary tract and may then invade the central nervous system/spinal cord. Inapparent infections and minor illness probably exceeds paralytic cases by more than a hundred-to-one when the infection occurs in the very young.

The infectious agent is the poliovirus types 1, 2, and 3. The reservoir is man. Poliomyelitis is characteristically transmitted by fecal-oral or pharyngeal modes. The incubation period for paralytic cases is 7 to 14 days. The period of communicability is not known. Probably cases are most infectious during the first few days before and after the onset of symptoms.

There is no specific treatment. Expert care is required during acute illness for patients who need respiratory assistance secondary to paralyzed muscles for breathing.

The two important preventive measures include (1) effective vaccines (inactivated and live virus) that are available and beneficial; and (2) education of the local public concerning the advantages of immunization and on the methods of spread when a case is diagnosed.

For hospitalized cases, enteric precautions are needed. The investigation of contacts is limited to a search for sick persons, especially children, to provide proper care to unrecognized and unreported cases.

Trivalent vaccines should be put into use at the earliest indication of an outbreak in a local population.

International travelers should be adequately immunized prior to visiting endemic areas, usually third world countries.

Rabies

Rabies is an acute viral disease of the central nervous system that is essentially 100 percent fatal. Symptoms include a sense of apprehension at the onset, malaise, fever, headache, and sensory changes referred to the site of the animal bite

wound. Symptoms progress to paralysis or paresis, spasms to the muscles of swallowing resulting in a fear of water (hydrophobia), and convulsions follow. The usual duration is 2 to 6 days; death often is due to respiratory paralysis.

The infectious agent is the rabies virus.

Rabies occurs worldwide and the reservoir, depending upon the country, is wild and domestic animals, including dogs, cats, skunks, raccoons, and some bats. Almost all mammals are susceptible to rabies.

Rabies is contracted by the introduction of virus-containing saliva of a rabid animal through a break in the skin, usually a bite. The incubation period in humans may range from 10 days to a year but is usually from 2 to 8 weeks.

The specific treatment for clinical rabies is intensive supportive medical care.

Preventive community measures rely heavily upon the licensing of dogs and cats with the documentation of antirabies vaccine receipt a requirement. Collect and destroy ownerless animals. Pet owners should be educated concerning necessary restrictions for dogs and cats, e.g., leashing or confining to owner's premises, or that strange-acting and sick animals of any species may be dangerous and should never be picked up or handled. Dogs and cats that have bitten a person or show signs of rabies should be detained 10 days for clinical observation. Wild animals and strays should be sacrificed immediately and the brain examined for evidence of rabies. Veterinary personnel should submit intact heads packed on ice (not frozen) of sacrificed animals or animals that die of suspected rabies to the cognizant laboratory for testing.

Individuals at occupational or operational high risk of wild/domestic animal bites should receive preexposure immunization with the antirabies vaccine. The prevention of rabies after an animal bite is based on physical removal of the virus by proper management of the bite wound and by specific immunization protection.

Rubella (German measles) and Congenital Rubella (Congenital Rubella Syndrome)

Rubella is a mild viral infectious disease. One to 5 days prior to the appearance of a rash, mild symptoms of malaise, loss of appetite, conjunctivitis, headache, low grade fever, and minimal respiratory symptoms may occur. The rash consists of a pink eruption, which begins on the face and spreads downward over the trunk and

extremities. About one-half of the infections occur without an obvious rash.

Congenital rubella causes defects of the developing fetus of pregnant women with rubella. Approximately 25 percent of infants born to women with rubella during the first trimester of pregnancy are affected.

Rubella occurs worldwide and is endemic almost everywhere except in remote isolated communities. This disease occurs most often in the winter and spring. It is a disease of childhood in unvaccinated populations and of adolescents and adults in populations where children are immunized.

The infectious agent is the rubella virus. The reservoir is man. Rubella is transmitted when susceptible persons contact nasopharyngeal discharges from infected persons. When susceptible persons live under crowded conditions, e.g., military recruits, all susceptible unimmunized persons will probably be infected if the virus is introduced.

The average incubation period is about 18 days. Rubella is communicable from about a week prior to the appearance of a rash until about 4 days after the appearance.

There is no specific medical treatment for rubella.

Preventive measures are primarily concerned with the immunization of susceptible persons. Immunization with one dose of live attenuated rubella virus vaccine produces a long-lasting immunity in about 95 percent of all susceptible persons. It is recommended that all children receive a vaccine of combined rubella/measles at about 15 months of age. Emphasis should also be placed on immunizing susceptible adolescent and adult females, because rubella continues to occur in women of childbearing age. However, pregnant women should not be vaccinated.

In hospitals or institutions, when a patient is suspected of having rubella, isolation in a private room is recommended. Every attempt should be made to prevent exposing nonimmune pregnant women to rubella. Children should be kept home from school and adults should not go to work for 7 days after the onset of a rash.

Sexually Transmitted Diseases

Sexually transmitted diseases (STDs) are among the most common communicable diseases. Because of embarrassment or lack of education, a great many cases go unreported and untreated. Changes in sexual behavior, and the fact that

many people are asymptomatic carriers, have added to the problems of control.

A hospital corpsman will have the responsibility of recognizing cases of sexually transmitted disease in the sickcall environment, initiating laboratory procedures to confirm the diagnosis, and educating personnel in recognizing the signs of sexually transmitted disease and the best way to avoid infection.

This section will deal with the most common types of sexually transmitted diseases: gonorrhea, nongonococcal urethritis, syphilis, and genital herpes. There are many other less common sexually transmitted diseases that are not covered here. Current medical journals and books are a good source of information, in addition to current Naval texts and Instructions.

Each STD case should be interviewed by a contact interviewer trained by preventive medicine personnel. Information gained from the interviewer should be recorded on the Venereal Disease Epidemiologic Report Form, CDC Form 9.2936A, and be forwarded to the appropriate agency. The *Interviewer's Aid for VD Contact Investigation*, NAVMED P-5036, contains guidance for conducting interviews. NAVMEDCOMNOTE 6222 series contains specific treatment requirements for sexually transmitted diseases.

Chlamydial Genital Infections

This infection causes urethritis in males and cervicitis in females. Clinically, in males the urethritis produces an opaque discharge of scanty or moderate quantity and urethral burning or itching on urination. Asymptomatic infections occur in 1 to 10 percent of sexually active men. In females, clinical symptoms similar to gonorrhea include inflammation and infection of the uterine cervix. Complications are infections of tube/ovaries with risk of infertility. Diagnosis of nongonococcal urethritis or cervicitis is usually based on the failure to demonstrate *Neisseria gonorrhoeae* on culture.

The infectious agent is *Chlamidia trachomatis*. The reservoir is man. The incubation period is 5 to 10 days or longer. Chlamydial genital infections are transmitted through sexual contact. The period of communicability is unknown. The specific treatment is tetracycline, doxycycline, or erythromycin, as directed by medical officer,

Preventive measures concerning health and sex education for this infection are the same for all sexually transmitted diseases. Emphasis should be

placed on the use of condoms for promiscuous sexual contacts.

Investigation of contacts includes as a minimum the prophylactic treatment of regular sexual contacts; treatment of all sexual contacts, whether or not symptomatic, is recommended.

Gonococcal Infection of the Genitourinary Tract

The symptoms, severity, and ease of recognition of the bacterial disease gonorrhea are different in males and females.

For urethral infections in males, 2 to 7 days after an infecting exposure, a purulent discharge appears from the anterior urethra with burning upon urination. The infection may spread to the posterior urethra and produce epididymitis, or it may be limited to the anterior urethra. Asymptomatic carriage may occur. Rectal infections may be asymptomatic or may cause itching, painful spasms with a desire to evacuate the bowel, and an anal discharge. Rectal infection is common in male homosexuals.

In females, an initial urethritis or cervicitis, so mild it may pass unnoticed, occurs a few days after an infecting exposure. There is a risk of infertility from infection of the tubes and ovaries.

In both males and females, pharyngeal and anal infections are due to direct sexual contact. Conjunctivitis in adults is rare. Deaths may occur with endocarditis. Arthritis from systemic spread may cause permanent joint damage if antibiotic therapy is delayed.

The infectious agent is the bacterium *Neisseria gonorrhoeae*. Man is the only reservoir. The incubation period normally ranges from 2 to 7 days. The period of communicability may range from days to months in untreated cases, especially in asymptomatic individuals. Effective antibiotic therapy normally stops communicability in 24 to 48 hours.

Specific treatment for gonorrhea is under the supervision of a medical officer and includes various combinations of procaine penicillin G, ampicillin, amoxicillin, and tetracycline. Penicillinase-producing *Neisseria gonorrhoeae* (PPNG) and chromosomally mediated penicillin-resistant (B-lactamase-negative) are new forms of gonorrhea that are resistant to penicillin; these are usually treated with spectinomycin or cephalosporin derivatives.

Preventive measures are important. They include (1) providing general health and sex education to military personnel; (2) encouraging

comprehensive diagnostic and treatment protocols; and (3) establishing case-finding programs, including interviews of patients and tracing of contacts.

Management of patients, contacts, and the nearby environment includes several principles. No isolation is required. Patients should avoid sexual contact until post-treatment cultures are negative for gonococci. Avoid previous untreated sexual partners to prevent reinfection. Investigation of contacts should include interviews of patients and location and treatment of contacts. Trained interviewers should be used when possible, especially with uncooperative patients. Immunization is not available.

Herpes Simplex

Two etiologic agents, herpes simplex virus (HSV) types 1 and 2, usually produce distinct clinical symptoms, depending on the portal of entry. HSV type 2 usually produces genital herpes; HSV type 2 principally occurs in adults and is sexually transmitted. In women, the most common sites of the primary lesions are the cervix and vulva; recurrent disease usually involves the vulva, perineal skin, legs, and buttocks. In men, lesions affect the penis or pubic areas and, in male homosexuals, the anus and rectum. Other genital or perineal sites and the mouth may be involved. Vaginal delivery of pregnant women with an active genital herpes infection gives a great risk of serious infection to the newborn, HSV type 2 infection in adult women is a possible risk factor associated with cervical cancer.

Herpes simplex occurs worldwide. HSV type 2 infection usually begins with sexual activity and is rare before adolescence.

The reservoir is man. The incubation period is from 2 to 12 days. The transmission of HSV type 2 to nonimmune adults is usually through sexual contact. Primary genital lesions are infective for 7 to 12 days. Each recurrent disease is infective from 4 to 7 days. Episodic reactivation of genital herpes occurs repeatedly in the great majority of patients for many subsequent years. Specific treatment for genital herpes is with the new topical and oral drug Acyclovir; this should be prescribed only by a medical officer.

Preventive measures include (1) the education of personnel on appropriate sexual hygiene practices; (2) encouraging the use of a condom in random sexual practice, to decrease the risk of infection when the health of the sex partner is unknown; and (3) the wearing of gloves by health

care personnel who examine potentially infectious lesions.

Syphilis

Syphilis is a treponemal disease that may be acute, or chronic. Symptoms appear in stages as the untreated disease progresses through primary lesion, a rash of the skin and mucous membranes, a long period of latency, and finally lesions of the cardiovascular system, central nervous system, viscera, bone, and skin. The first symptom, a papule, appears within 3 weeks at the site of the direct exposure contact and often erodes to form an indurated painless ulcer (chancre). This is primary syphilis. After 4 to 6 weeks the chancre heals and the rash appears. This rash is flat, reddish, and patchy, affects the trunk and extremities, but characteristically is seen on the palms and soles. This rash typifies secondary syphilis. Within a few weeks or up to 12 months, the rash disappears and is followed by a latency period that may last from weeks to several years. Sometimes latency continues through life and recovery may occur. In many instances, after 5 to 20 years of untreated disease, lesions of tertiary syphilis can invade and destroy tissue in the skin, bone, central nervous system, heart and aorta.

The diagnosis for primary and secondary syphilis is confirmed by a dark field microscopic examination of material from genital lesions or aspirates from lymph nodes, as well as the serologic test for syphilis in blood or cerebrospinal fluid.

The infectious agent is *Treponema pallidum*, a spirochete. The reservoir is man. The incubation period is usually 3 weeks and ranges from 10 days to 10 weeks. Transmission is by direct contact with exudates of moist lesions or body fluid secretions from mucosal surfaces (e.g., vagina, rectum, or pharynx) of infected persons during sexual contact. It can also be transmitted by kissing or fondling involving infected surfaces/lesions. Transmission can also occur through blood transfusion. Fetal infection can occur through placental transfer. The period of communicability is variable and indefinite. Adequate antibiotic treatment usually ends communicability within 24 to 48 hours.

Specific treatment as directed by a medical officer is the parenteral long-acting penicillin G. It may be given in a single large dose of 2.4 million units. Increased dosages and longer periods are indicated for the late stages of syphilis.

Preventive measures should emphasize the control of patients in a transmissible stage and should include a search for person with latent syphilis to prevent relapse and disability. Congenital syphilis is prevented by performing serologic examinations during early and late pregnancy and ensuring treatment of positive reactors.

Measures that promote general good sexual health are encouraged. This includes health and sex education in preparation for marriage. Syphilis serology tests should be included in the workup of all cases of sexually transmitted diseases and as a part of prenatal examinations.

Sexual promiscuity and contacts with prostitutes should be discouraged.

Provide good medical facilities for early diagnosis and treatment of syphilis. Establish case-finding programs that include interview of patients and tracing of contacts.

Patients should avoid sexual contact until lesions clear with proper antibiotic treatment.

The most important aspect of syphilis control is the interview of patients to identify contacts. Best results are obtained by trained interviewers. The criteria for contact tracing depends on the stage of the disease. For primary syphilis, interview all sexual contacts for 3 months prior to the onset of symptoms; for secondary syphilis, those for the 6 preceding months; for early latent syphilis, those for the preceding year if the time of primary and secondary lesions cannot be established; for late and late latent syphilis, marital partners and children of infected mothers; and for congenital syphilis, all members of the immediate family. All identified contacts of confirmed cases of early syphilis should receive therapy.

Shigellosis (Bacillary dysentery)

Shigellosis is a bacterial infection of the intestines. Signs and symptoms are diarrhea, fever, nausea, vomiting, and abdominal cramps. Usually the stools contain blood with mucus and pus. Watery diarrhea can also occur. The average case lasts from 4 to 7 days.

The diagnosis is established by isolation of *Shigella* from the stool or rectal swabs. Shigellosis occurs worldwide with the majority of the cases in children younger than 10 years of age.

The infectious agents are the four *Shigella* species. Man is the only significant reservoir. Shigellosis is transmitted through direct or indirect fecal-oral transmission. The incubation period

may vary from 1 to 7 days. Patients are communicable during the acute stage until *Shigella* is no longer found in the stool, about 4 weeks after the disease. In a few cases, a carrier condition may last for several months. Asymptomatic carriers may also transmit shigellosis. Shigellosis is more severe in young children.

Treatment is with fluid replacement and antibiotics.

Preventive medicine personnel should be prepared to evaluate each outbreak and provide recommendations to prevent the spread of disease for each local situation.

Preventive measures include (1) sanitary disposal of patient feces; (2) scrupulous handwashing by patients after defecation and by health care persons attending the patient; (3) proper food sanitation measures for preparation, handling, and refrigeration; (4) in rural areas, proper fly control and refuse (food, etc.) disposal.

Management of patients, contacts, and the nearby environment includes (1) use of enteric precautions for the patient during the acute illness; (2) excluding all contacts of shigellosis patients from foodhandling and child or patient care until two negative stool cultures are obtained; and (3) in the investigation of contacts, stool cultures should be restricted to foodhandlers, child care worker, children, and others where disease transmission is likely.

Epidemic measures require that preventive medicine personnel should investigate milk, food, water supplies, and general sanitation.

There is a potential problem of major epidemics in situations where people are crowded together with deficient environmental sanitation, e.g., institutions and refugee camps.

Smallpox

Smallpox as a naturally occurring disease was certified eradicated from the world by the World Health Organization in May 1980. The occurrence of even a single case, acquired from a laboratory or naturally, would be a grave emergency and require immediate effective control measures.

Smallpox is a systemic viral disease with a sudden onset characterized by fever, headache, backache, abdominal pain, malaise, and prostration. After 2 to 4 days, the temperature falls and a rash develops. The rash progresses through macules to vesicles/pustules and scabs. After about a month, the lesions heal and the scabs drop off. Lesions appear first on the face and then on the trunk and extremities. More lesions develop

on the face and extremities than on the trunk. The rash may be mild or absent, or with only a few lesions in previously vaccinated patients.

Two types of smallpox were historically recognized, variola minor (alastrim) and variola major (classical smallpox). The fatality rate for unvaccinated cases of classical smallpox ranged from 15 to 40 percent, with death usually occurring during the second week. The fatality rate for variola minor was about 1 percent.

The infectious agent is the variola virus, which is maintained in cultures for research in a few restricted laboratories.

Smallpox transmission was occasionally airborne but usually occurred by contact with body discharges, e.g., respiratory, skin lesions, and contact with articles and material contaminated by patients. Sometimes unrecognized cases were the source of large secondary outbreaks. The average incubation period is for 10 to 12 days. The disease is communicable during the period of lesions, usually about 3 weeks. Supportive treatment is as directed by a medical officer.

Regarding preventive measures, routine vaccination is no longer recommended or required for international travel. However, research personnel in the few laboratories handling the smallpox virus are vaccinated. Some countries, including the United States, continue to vaccinate military forces. Vaccinations are administered to the U.S. military only when members can be isolated from the general public for about 2 weeks, that is, during basic training.

Staphylococcal Disease

Many staphylococcal infections result in lesions of the skin such as infected lacerations, abscesses, carbuncles, and boils. Most frequently these skin lesions are localized and discrete. When lesions are widespread, constitutional symptoms such as loss of appetite, headache, malaise, and fever may accompany. Normally lesions are uncomplicated, but sometimes the organisms may be carried by the blood stream and result in abscesses of the lung, bone, and brain, as well as meningitis. These complications may also occur from the parenteral use of illicit drugs with contaminated needles. Staphylococcal infections occur worldwide, but most frequently in areas where people are crowded and personal hygiene is not adequate.

The infectious agents are various strains of *Staphylococcus aureus*. The organisms may be identified by several laboratory methods.

Epidemics are usually caused by strains resistant to penicillin. The reservoir is man. The incubation period for most problems is usually from 4 to 10 days. Transmission is usually by direct contact with a person who has a purulent lesion or is an asymptomatic carrier. The anterior aspect of the nasal canal is the major site of colonization for carriers.

Staphylococcal disease is communicable as long as purulent lesions are present or the carrier state continues. Autoinfection can continue throughout the period of nasal colonization or as long as a purulent lesion exists.

Preventive measures involve education on personal hygiene to groups at risk as well as appropriate wound/abscess management and antibiotics.

Isolation of patients is not practical in most communities. However, patients with infections should avoid contact with the newborn and chronically ill, who are most at risk.

When outbreaks occur in homes, offices, or on ships, etc., an investigation should be done to look for common sources (index cases).

Streptococcal Disease (Group A Type)

Streptococcal sore throat presents symptoms of tonsillitis or pharyngitis, fever, and tender anterior lymph nodes. The pharynx, tonsils, and soft palate may be red and swollen. Otitis media, peritonsillar abscesses, glomerulonephritis, and rheumatic heart disease are complications that may follow.

Streptococcal skin infections such as impetigo may occur. These occur as vesicles, pustules, and then crusting lesions.

Scarlet fever is a type of streptococcal disease; it is characterized by a skin rash that occurs when the invading strain of streptococcus produces a toxin to which the patient is sensitized. Other symptoms may include a sore throat, wound or skin infection, strawberry tongue, and exanthem. High fever, nausea, and vomiting occur often with severe cases.

Erysipelas is a form of severe streptococcal cellulitis that is accompanied by fever. Skin lesions are red, tender, swollen, and spreading. The center point of origin usually clears as the periphery extends. The periphery of the lesion frequently has a definite raised border.

The diagnosis of streptococcal disease is established by a culture of organisms from the affected tissue.

Streptococcal diseases in the United States may be endemic or sporadic. Foodborne epidemics occur in any season. Military and school populations are frequently affected. The incidence rate is highest in the 3- to 15-year-old age group.

The reservoir of streptococcal disease is man. Streptococcal diseases are usually transmitted by direct contact with a patient or carrier and rarely through contact with the hands or objects. Streptococcal sore throat may be transmitted by contaminated food causing sudden large outbreaks of cases.

The incubation period is for 1 to 3 days, occasionally longer. Untreated cases will often resolve spontaneously after a few weeks. Treatment is given to reduce communicability and to prevent serious complications.

The specific antibiotic treatment is penicillin. For those patients sensitive to penicillin, erythromycin is the preferred alternative.

Preventive measures include (1) making laboratory facilities available for the diagnosis of group A hemolytic streptococcal diseases; (2) ensuring public education concerning methods of transmission, seriousness of complications, and the necessity of taking the full prescribed course of antibiotic therapy; (3) educating food service personnel on proper hygiene and food preparation techniques to prevent contamination with the bacteria; (4) excluding individuals with respiratory illness or skin lesions from food handling; and (5) prescribing long-term antibiotic prophylaxis with penicillin for those individuals at special risk (e.g., with a history of recurrent erysipelas or rheumatic fever). Patients with streptococcal disease should be educated about proper throat/wound hygiene.

During outbreaks of streptococcal disease, investigations should find the source and method of spread.

Tetanus (Lockjaw)

Tetanus is a serious disease caused by an exotoxin produced by the tetanus bacillus, which grows under anaerobic conditions in the site of an injury. Symptoms include painful muscular contractions, usually of the jaw and neck muscles and secondarily in the trunk muscles. Commonly the first symptom is abdominal rigidity and sometimes rigidity of the muscles in the region of the wound. Often generalized muscles spasms occur that are induced by sensory stimuli. The fatality rate will range from 30 to 90 percent. Laboratory confirmation is of little value because

the infectious organism is itself rarely found in the wound.

Tetanus occurs worldwide. Occurrence is uncommon and sporadic in industrial countries, and it is more common in agricultural regions and underdeveloped countries.

The infectious agent is the bacillus *Clostridium tetani*. The reservoir is the intestinal tract of animals and man and soil contaminated with their feces. The incubation period averages about 10 days and ranges from 1 day to several months. Transmission is by introducing tetanus spores into the body through a wound, usually a puncture wound. Tetanus is not communicable directly from man to man.

The specific treatment includes tetanus immune globulin, administered intramuscularly or intravenously, and intensive medical support.

Preventive measures are based on appropriate immunizations. Immunization with a basic series of tetanus toxoid, with a booster at 10-year intervals, is required of everyone. Tetanus prophylaxis for patients with wounds requires careful determination and assessment of whether the wound is clean or contaminated, in addition to the appropriate use of tetanus toxoid and/or tetanus immune globulin, wound cleansing, and surgical debridement. The proper use of antibiotics is also needed. The public should be educated concerning the need for proper wound care and active and/or passive prophylaxis after significant injury to the skin.

International travelers should maintain an up-to-date immunization for tetanus.

Tuberculosis

Although tuberculosis may affect many organs, it is primarily a pulmonary bacterial disease that may result in death and disability. The infection usually causes pulmonary lesions that heal within a few weeks without being noticed. The only evidence of this invasion may be lymph node calcifications in the lungs or chest. In some cases, the initial invasion progresses to pulmonary tuberculosis with symptoms of weight loss, fever, cough, chest pain, and, in advanced stages, hoarseness, and bleeding from the lungs. Less frequently, extrapulmonary tuberculosis occurs when the bacillus is disseminated to other parts of the body through the lymph and blood systems.

Tuberculosis infection is inferred when the tuberculin skin test is equal to or greater than 10 mm of induration. A presumptive diagnosis is made by demonstrating acid-fast bacilli in stained

smears of sputum or other body fluids, and is confirmed by isolation of the tubercle bacilli on culture.

Tuberculosis occurs worldwide. The infectious agent in humans is primarily *Mycobacterium tuberculosis*. The most important reservoir is man and, in some areas, cattle. The incubation period from infection to primary lesion or positive tuberculin skin test reaction is about 2 to 12 weeks.

Tuberculosis may be communicable as long as tubercle bacilli are discharged in the sputum. Extrapulmonary tuberculosis is generally not considered communicable. Susceptibility to tuberculosis is general. Children under 3 years old, adolescents, and young adults are at greatest risk. Susceptibility to disease is increased in the undernourished or underweight and in those with chronic conditions such as diabetes and alcoholism.

NAVMEDCOMINST 6224.1 series provides guidelines on the control, screening, follow-up and treatment, and reporting of tuberculosis among Navy and Marine Corps personnel and dependents. Control and screening are primarily with the use of purified protein derivative (PPD) intradermal injections. High risk personnel who require annual screening are all medical/dental personnel or fleet personnel. Individuals whose PPD skin test show them to be positive for a past or present infection are placed on a 1-year program of antituberculosis medication and periodic evaluations.

Active tuberculosis cases are treated with specific drugs under the direction of a medical officer. Respiratory isolation precautions are used for hospitalized patients. Contacts of active cases—whether in a household, office, or ship—are evaluated with situational PPD skin testing for evidence of infection.

Typhoid Fever

Typhoid fever is a serious systemic bacterial disease characterized by symptoms of fever, loss of appetite, malaise, headache, cough, red spots on the trunk, and constipation, or diarrhea.

Typhoid fever occurs worldwide. In the United States and other areas with developed sanitary facilities, most cases are imported from endemic areas.

The infectious agent is *Salmonella typhi*, the typhoid bacillus. The reservoir is man. The incubation period is from 1 to 3 weeks. Transmission is through food or water contaminated by the feces or urine of a carrier or patient. Shellfish

from sewage-contaminated water, raw fruits and vegetables, and contaminated milk and milk products are important vehicles in some areas of the world.

Typhoid fever is communicable as long as typhoid bacilli remain in the feces or urine. Many patients not appropriately treated become permanent carriers.

Specific antibiotics are the treatment of choice.

Preventive measures include (1) in field situations, providing for the sanitary disposal of human feces, and adequate handwashing facilities; (2) ensuring that fly proof latrines are away from and downstream from the source of drinking water; (3) controlling fly populations by screening, with insecticides, and by the proper collection and disposal of garbage to prevent breeding places; (4) requiring proper food preparation and handling and proper refrigeration; (5) at foreign ports, limiting the acquisition of shellfish to supplies from approved sources; (6) instructing patients, convalescents, and carriers concerning food personal hygiene; (7) excluding carriers and infected persons from food handling. Immunization for the general population in the United States is not recommended. Immunization boosters are required for many Navy and Marine Corps personnel and recommended for travelers to endemic areas.

For patients, isolation includes enteric precautions while they are ill. Cases should not be released from medical supervision until three consecutive cultures of feces taken at 1 month intervals after the onset and 24 hours apart are negative. If any one of these cultures is positive, repeat at intervals of 1 month until three negative cultures are obtained. Do not assign household contacts to food handling until two feces cultures taken 24 hours apart are negative.

The probable or actual source of every case should be determined by searching for unreported cases, carriers, and contaminated food, water, milk, or shellfish.

Epidemic measures include (1) searching for cases, carriers, or contaminated food or water that may be transmitting the infections; (2) the exclusion of suspected food; and (3) disinfecting all suspected water with chlorine or iodine, or boiling it before use.

During natural disaster situations, the transmission of typhoid fever may be expected with the disruption of food and water supplies and excreta disposal in a displaced population if cases or carriers are present. Vaccination of such populations is not generally recommended; efforts

to provide safe food, water, and excreta disposal are more effective.

Typhus Fever, Epidemic Louse-Borne

Typhus is caused by rickettsial agents, similar to bacteria. The onset is frequently sudden and commences with general pain, fever, chills, headache, and prostration. After 5 to 6 days, a macular red rash becomes apparent on the upper trunk and then covers all the body, usually with the exception of the soles, palms, and face. Toxemia is normally present. After about 2 weeks of fever, typhus ends with rapid recovery. Without specific treatment, the fatality rate is 10 to 40 percent and increases in older persons. Cases may be mild with an absence of rash, particularly in children and persons partially protected by a previous immunization. In the Brill-Zinsser Disease, typhus recurs (without another exposure) many years after recovery from the first infection. The Brill-Zinsser disease is less serious with milder symptoms and has a lower fatality rate.

Diagnosis may be established by serological tests.

In the past, outbreaks of typhus often accompanied famine and war. Typhus is endemic in the mountainous areas of Central and South America, central Africa, and many countries in Asia. In the United States, the infectious agent causes a disease in flying squirrels, which may be passed to man by their fleas.

The infectious agent is *Rickettsia prowazekii*. The reservoir is man. Typically, the body louse is infected when it feeds on the blood of a person with typhus fever. Man is infected by crushing and rubbing an infected louse or its feces into the bite wound or other break in the skin. Some cases may result from inhalation of dried airborne flea feces. The incubation period averages about 12 days.

Treatment is with antibiotics.

Methods of control include control of lice with insecticide dusts, washing clothes and bathing, and immunization of susceptible persons at high risk, e.g., local military and labor forces and residents.

Management of patients, contacts, and the nearby environment includes (1) no requirement for isolation after delousing patients, contacts, clothing, and quarters; (2) concurrent disinfection of patients, contacts, bedding, and clothing with approved insecticides; (3) quarantine for 15 days for susceptible louse-infected persons exposed to typhus; and (4) surveillance of immediate contacts for 2 weeks.

The epidemic potential is serious in louse-infested populations. Epidemics may be expected in wars, famines, and other conditions, where people are overcrowded and malnourished. Poor personal hygiene encourages pediculosis. During epidemics, all contacts and perhaps the entire community should be deloused with a residual insecticide. Administer the vaccine to susceptible persons, if directed.

Immunization is not required for international travel.

Yellow Fever

An attack of yellow fever usually results in abrupt signs and symptoms of fever, headache, backache, nausea, vomiting and prostration. Later in the course of the disease, the heart rate slows and becomes weaker, and there is a decreased output of urine. Bleeding may occur from the nose, mouth, and stomach. The stools become dark colored and tarry due to the presence of blood. Jaundice is mild early in the disease and becomes pronounced later. The mortality rate may be very high.

Urban yellow fever (transmitted by the *Aedes aegypti* mosquito) has not occurred in the Americas since 1954. However, outbreaks of urban yellow fever are now reported from other countries/continents. Jungle yellow fever is found in several African countries and in Central and South America.

The infectious agent is the yellow fever virus. Man and the *Aedes aegypti* mosquito are the reservoirs for urban yellow fever. The reservoirs for jungle fever are monkeys, marsupials, and forest mosquitoes. Man acquires the disease when bitten by an infected mosquito. The incubation period is from 3 to 6 days. Patients with yellow fever are infective from just prior to the onset of fever through the first 3 to 5 days of the illness. When infected, mosquitoes remain so for life.

There is no treatment other than supportive measures.

Preventive measures against urban yellow fever are primarily through eradication of the *Aedes aegypti* mosquitoes. Vaccination for humans is also indicated. Jungle yellow fever can be controlled best by immunizing all persons who work or visit endemic areas. Any person who enters these areas should use protective clothing, repellents, and bed nets.

Management of patients, contacts, and the nearby environment includes patient blood isolation precautions. In rural areas, deny mosquitoes

access to patients for at least 5 days after the onset by screening, spraying with residual insecticides, and using bed nets. Insecticides should be applied in all houses in the area.

As part of the investigation, question the patient about all places visited 3 to 6 days prior to the onset to determine where yellow fever was acquired (focus), and place all persons visiting the focus under surveillance. Survey suspected areas for mosquitoes that transmit the disease and eradicate them with approved insecticides, if possible. Investigate deaths and mild illnesses with fever in the area to determine if yellow fever was involved.

International measures require that ships, aircraft, and land transportation arriving from areas where yellow fever is endemic will follow regulation outlined in International Health Regulations. Many countries require a valid international certificate of yellow fever vaccination when traveling through or from yellow fever areas. The certificate is valid from 10 days after vaccination through the next 10 years.

HEALTHFUL LIVING ASHORE AND AFLOAT

As a Medical Department representative, you will often be called upon to help ensure that all hands have healthful living conditions, both ashore and afloat. This manual gives only a rough outline of your responsibilities. To perform adequately in this area, you must become familiar with the BUMED/NAVMEDCOM Instructions in the 6200 series, the *Manual of Naval Preventive Medicine* (NAVMED P-5010), and other applicable manuals and publications that may be referenced or become available to you.

FOOD SANITATION

Foodborne illnesses are an ever-present danger in the military environment. They pose a real threat to the health and morale of our personnel. To prevent their occurrence, one must ensure that all foods are procured from approved sources and processed, prepared, and served with careful adherence to recommended sanitary practices. The majority of foodborne illnesses can be traced to food that has been prepared too far in advance; inadequate refrigeration; disregard for temperature and time factors; or food service personnel who ignored or are inadequately trained in food handling techniques. These points need to

be kept in mind and stressed during inspections of food service facilities.

Health Standards for Food Service Personnel

Food service personnel are a most important link in the transmission of disease through foods. Their health, personal habits, and methods of preparing and serving food are vital factors in maintaining the health and well-being of all hands.

All food service personnel (military and civilian) will be examined and determined to be free from communicable disease prior to an initial assignment in food service. The physical examination shall be comprehensive enough to detect acute or chronic disease. Laboratory tests will be accomplished at the discretion of the senior medical officer. All food service personnel will be examined for evidence of tuberculosis.

Personnel having open lesions, particularly of the hands, face, or neck, or acne of the face, shall be prohibited from performing food service duty.

Examinations of personnel with questionable social or medical histories shall be comprehensive and include X-rays of the chest if there is a clinical indication, stool and urine examinations for parasites and bacterial pathogens, and such other laboratory tests and physical determinations as may be indicated.

All food service personnel who have been away from their duties for 30 days or more for nonmedical reasons must receive a medical examination prior to resumption of their food service duties. All food service personnel who have been away from their duties for any period of time as a result of illness must receive authorization from the Medical Department prior to resumption of duty.

Training and Hygiene of Food Service Personnel

All food service personnel shall be thoroughly indoctrinated in personal hygiene and food sanitation, as well as in the methods and importance of preventing foodborne illness. The requirement for food service training is specifically addressed in SECNAVINST 4061.1 series. All food service personnel are required to have initial training and annual refresher training in food service sanitation principles. Evidence of completion of this

training is maintained on the Foodservice Training Certificate, NAVMED 4061/6, which is to be kept on file by the food service officer at the work location. These records must be verified by supervisory and Medical Department personnel during routine sanitation inspections.

All food service personnel must be physically clean and wear clean garments when working in food service areas. Personnel will wear caps or hairnets that completely cover the hair at work. No beards will be authorized for personnel directly involved in the preparation and handling of food. Personnel shall keep their nails clean and trimmed short, and special attention shall be directed to the cleanliness of the hands. Adequate and convenient handwashing facilities with hot and cold running water, soap, and disposable towels shall be provided. Personnel will be instructed to wash their hands with soap and potable water before assuming duty and always after using rest rooms. Conspicuous signs to this effect will be posted. Do not use tobacco in any form in the scullery, food preparation, storage, and service areas.

VECTOR AND ECONOMIC PEST CONTROL

The term vector is used as "all insects, related arthropods, or rodents capable of transmitting pathogens of public health significance." Pests, on the other hand, may be defined as organisms that by their nature or habits are objectionable in shipboard or shore environments and are, therefore, detrimental to morale.

It is the responsibility of the Medical Department to survey and control disease vector organisms aboard naval vessels, on naval bases, in Fleet Marine Force units, and as directed in contingency and disaster relief situation. Pest control (of nuisance or economic pests) is routinely a medical department responsibility on board vessels and those commands lacking Public Works support. Disease Vector Ecology and Control Centers (DVECCs) and Environmental and Preventive Medicine Units (EPMUs) are fully staffed to respond to all calls for assistance regarding medical or economic pest matters throughout the world.

Table 11-1 lists some of the more commonly encountered pests with a summary of their importance, characteristics, biology, surveillance,

Table 11-1.—Guide for commonly encountered pests

Pests	Importance	Characters/Biology	Survey	Control
Cockroaches	Morale Factor; contaminant food	German: small light brown with 2 dark stripes on dorsum of thorax; omnivorous; nocturnal; inhabit cracks and crevices 3/16" or less in width	Flush harborage every 2 weeks with pyrethrin or resmethrin aerosol and 1% Baygon	Excellent sanitation supplemented with chemical control
Rodents	Serve as hosts for plague and murine typhus vectors; poison food; contaminate and eat stored foods	Norway rat: stout body, blunt nose, tail shorter than body, brown Roof rat: slender body, pointed nose, tail longer than body, black to gray House mouse: small and slender, tail longer than body	Look for gnawing on food packages, nests, rub marks, tracks, droppings, live or dead rodents, odors	Prevent entry with metal rat guards; provide minimum access to food and shelter; use rat traps indoors and rodenticides outdoors
Stored Products Pests	Over 100 species of moths and beetles exist; infest stored goods, creating economic loss; morale factor	Small, photophobic; rapid breeding; prefer confined areas with high temperature and humidity	Inspect incoming goods for holes, feces, webbing, cast skins, live or dead insects; inspect seams and flaps of packages in storerooms periodically	Remove infested goods; clean up all spills; rotate stock; maintain good sanitation; insecticide treatment. Keep high infestibles (cornmeal, grits, farina) in the chill box or freezer
Crab lice	Ectoparasites; morale factor	Small, whitish; abdomen very short; large 2nd and 3rd pair of legs give crablike appearance	Found on pubic hairs, also on hairs of chest, armpits, eyebrows, and beard; eggs (nits) found glued to body hairs	Kwell ointment (1% lindane); 1% malathion dust; segregation of infested personnel

Table 11-2.—Control of arthropod disease vectors

Vector	Disease Transmitted	Control Methods	Personal Protective Methods
Mosquitoes	Malaria filariasis dengue fever encephalitis yellow fever	Water control; surveys; larvaciding; fogging	Repellents; bed nets; long sleeves at night; chemoprophylaxis for malaria; vaccination for yellow fever
Flies	Dysentery salmonellosis cholera typhoid	Proper disposal of feces and garbage; residual and space sprays; screening rest rooms and galleys	Personal hygiene
Fleas (and rodents)	Plague murine typhus	Flea control with insecti- cide prior to rodent con- trol; rodenticides	Individual use of insecticide powder; blousing of trouser legs into boots without metal or rubber bands
Body lice	Louse-borne typhus relapsing fever	Proper laundry service	Individual use of insecticide powder; segregation of infested personnel; personal hygiene
Ticks	Spotted fever tick paralysis tick-borne typhus	Weed and underbrush control where practical; area application of pesti- cides	Repellents; proper blousing of trousers
Mites	Scrub typhus hemorrhagic fevers	Rodent, weed, and under- brush control	Repellents and clothing; acar- icides

and control techniques. Vectors are similarly listed in table 11-2.

Training and Certification

The Navy has recognized that the application of pesticides ashore and afloat requires a high level of training to ensure both safety and effectiveness. Three basic types of training are available through the DVECC or EPMU system. The enabling instructions are listed below:

- Shipboard Pest Management Specialist (NAVMEDCOMINST 6250.13 series)
- Vector Control Specialist (NAVMEDCOMINST 6250.12 series)
- Department of Defense Pesticide Control Operator (DODINST 4150.7 series)

Shipboard pest management specialists are corpsmen who are either responsible for the application of pesticides or who are the senior MDR on board Navy vessels. Completion of a 1-day class and one-half day on-the-job training session is required. Attendance at a shipboard class is required annually to keep this category current.

Shipboard pest management specialists are authorized to use noncontrolled standard stock pesticides. These pesticides are ready-to-use formulation (which do not require dilution) and have labels that allow safe application for a variety of situations. The label on the product and the Navy Shipboard Pest Control Manual will guide personnel in the proper use of these pesticides.

Vector control specialists are preventive medicine technicians (PMTs) who have received specialized training in the control of insects and rodents that are vectors of human illness. This training is of special use in preventive medicine support of the Fleet Marine Force and in contingency situations. This initial training is conducted at DVECC Alameda. Recertification is required every 3 years and is held at EPMUS and DVECCS.

Pesticide Safety

All pesticides sold in the United States are required by law to carry a label that lists the ingredients and outlines the basic safety information for that product. Take the time to review the label each time before using any pesticide rather than relying on your memory.

Pesticides vary considerable in toxicity. But consider all pesticides to be potential hazards to human life and follow basic safety precautions rigidly. Regardless of the insecticide in use, it is standard practice to protect food, cooking utensils, and food preparation surfaces and to avoid human contact with the pesticide.

The individual facing the greatest potential hazard in these operations is the applicator. To minimize his exposure, certain safety precautions are required of applicators:

- Wear protective clothing to protect your body. Coveralls, a hardhat, and rubber boots designated for this job and stored separately from pesticides are the applicator's first line of defense.
- An OSHA- and NIOSH-approved respirator is also required. Ensure that the replaceable cartridges used are designated for pesticide protection, and change them when you smell pesticide or every 8 hours of use, whichever comes first.
- Wear vented goggles to protect your eyes. Stack trap goggles of many different designs seem to offer the best protection without fogging up.
- Lightweight flexible gloves made of neoprene should be worn to protect your hands. Surgical gloves are NOT a satisfactory replacement.
- Take a shower after you are through with the job. If you did get some pesticide on you and were not aware of it, this will minimize your exposure.

CONTROL OF INSECTS AND CARRIERS

FLIES.— Flies transmit many human and zoonotic diseases that may seriously hamper military activities. The annoyance created by all fly species seriously impacts on morale. One of the most serious of these pests is the house fly, which is capable of transmitting disease-producing organisms through its vomitus and excrement and on its contaminated feet, body hairs, and mouthparts. Chief among these organisms are those that cause cholera, dysentery, and typhoid fever. All flies have two wings and four major developmental stages, e.g., egg, larva, pupa, and adult.

Control of domestic flies depends upon approved environmental sanitation in conjunction with selected application of insecticides. With proper sanitation, less dependence needs to be placed on insecticides. Any fermenting or decaying organic matter, including human and animal feces, dead animals, fish and meat refuse, and discarded food stuffs, are potential breeding places for flies. Prevention of fly breeding and entry into buildings reduces the potential for disease transmission.

Proper disposal of food service wastes, including all garbage and liquids, such as wash water, reduces the attraction of flies to dining facility areas. Garbage should be deposited in containers with tight-fitting lids, which should be washed regularly. Make sure these containers are kept outside of dining facilities, preferable off the ground on a stand or rack.

For troops in the field, short-term control of flies by chemicals may be the only practical method. Larviciding usually is not practical in large operations, because breeding places are too scattered for effective treatment. However, this method is indicated in areas of concentrated breeding, such as garbage handling zones, compost piles, and carcasses. In all larvicidal treatments, emphasis must be placed on getting the insecticide to the site where it can act on the larvae. Extensive reliance on larviciding, however, should be avoided since it probably precipitates the development of resistance. Where latrine contents are relatively dry, fly breeding can be controlled by sprinkling paradichlorobenzene (PDB) over the pit surface at a rate of approximately 2 ounces (59.15 ml) per latrine per week. This treatment is effective only when pits are deep, dry, and unventilated.

Application of residual insecticides to areas of fly concentration may be necessary to provide an additional level of control. The surface areas to be treated include resting places in buildings, such as overhead structures, hanging cords, moldings, and door/window facings. Several insecticides from the Federal Supply Catalog can be applied as selective spot treatments and will provide good indoor control for about 1 week. Residual insecticides may be applied to resting places such as building exteriors near breeding sites, open sheds, garbage cans, shrubs, and low trees by means of spray equipment with a fan-type nozzle, paint brushes, or rollers. Spray to the point of run-off and avoid contamination of food or utensils. Do not permit personnel or utensils to contact wet treated surfaces.

Miscellaneous control methods include screens, high velocity fans over doorways, self-closing doors, baits, and fly paper.

MOSQUITOES.— Mosquitoes rank first in importance among insects that transmit disease to man. The genera most frequently associated with disease transmission are *Aedes*, *Anopheles*, and *Culex*. *Anopheles* mosquitoes transmit malaria. Dengue is transmitted only by *Aedes* mosquitoes. The common mosquito, *Aedes aegypti*, transmits yellow fever. Several genera, including *Culex*, transmit the worms that cause filariasis. The causative viruses of arthropod-borne viral encephalitides are primarily transmitted by mosquitoes. Besides being disease-bearing agents, mosquitoes are an annoyance and can interfere with mission accomplishment in areas where high numbers occur.

Mosquitoes deposit their eggs on the surface of water or on surfaces subject to flooding. Larvae hatch and feed on organic matter in the water, pupate, and eventually change into adults. Only the females feed on blood.

Mosquito-control methods are classified as either permanent or temporary, depending on whether they are designed to eliminate breeding areas (source reduction) or simply to kill the present population. Permanent mosquito-control measures are considered in detail in NAVFAC MO-310.

Control of mosquito breeding is accomplished by the following means:

1. Simple draining of impounded water;
2. Filling in low spots;
3. Adding mosquito-eating fish (*Gambusia*) to larger permanent bodies of water;
4. Removing or burying small artificial containers (cans, tires, or other water-holding receptacles); or
5. Using larvicidal insecticides, which maybe in the form of liquids, dusts, or granules. The use of granules is indicated to penetrate dense vegetation or to prevent possible damage to crops (e.g., rice). OPNAVINST 6250.4 series defines the limited use of aircraft for insecticide dispersal.

Adult mosquitoes may be controlled by the application of residual and space sprays. Indoors, space sprays are recommended for immediate control. Treatment with a standard aerosol can should be at a rate of 7 seconds per 1,000 cubic feet of space. This will have little or no residual effect.

Aerosols or mists, especially ultra low volume spray techniques, are used for outdoor control of adult mosquitoes in addition to treatment of breeding sources. Aerosols are considered desirable in preventing annoyance by mosquitoes in limited bivouac areas. Aerosol operations should be accomplished when wind speeds are less than 6 knots and when target species are active. Residual sprays have limited applicability for the protection of small camps. When used, the spray is applied to all vegetation surfaces for an area of 30 meters (32.8 yds) or more around the place to be protected. Additional protective measures include screening living quarters, personal protection with insect repellents, insect repellent jackets, bed nets, and locating camps away from standing water and native villages to avoid contact with potentially infected mosquitoes.

LICE.— The infestation of the hairy parts of the body with lice is called pediculosis. Human lice are responsible for the transmission of louse-borne typhus, trench fever, and louse-borne relapsing fever. Louse-borne typhus is one of the few insect-transmitted diseases for which man serves as the reservoir. Trench fever is thought to be related to typhus fever. It does not kill, but it can be a debilitating epidemic disease among louse-infested troops. Louse-borne relapsing fever is caused by a spirochete. It is most prevalent in parts of Europe, North Africa, and Asia. In addition to serving as a vector of these serious diseases, lice cause a great deal of misery for infested people. Human louse species do not normally infest animals.

Three types of lice infest man: the body louse, *Pediculus humanus corporis*; the head louse *P. humanus capitis*; and the crab louse, *Phthirus pubis*. The body louse is found on the body and along the seams of undergarments. The head louse is found on the head and neck, clinging to hairs. The eggs (nits) of the head louse are firmly attached to the hair. Head and body lice are normally acquired by personal contact, by wearing infested clothing, or by using contaminated objects such as combs and brushes.

Crab lice usually infest the pubic and anal regions, but occasionally also the eyebrows, armpits, and other areas of the body. These insects feed intermittently for many hours at a time and are unable to survive more than a short time away from the host. Crab lice are spread mainly by physical contact during sexual intercourse.

Control of lice includes delousing of individuals, treatment of infested clothing, bedding,

living areas, and toilet facilities, and the prevention of new infestations. Louse control measures should be coordinated with a medical officer. The following preventive measures should be taken, especially during crowded shipboard and tenting conditions:

1. Treat louse-infested individuals and materials immediately.
2. Encourage personal cleanliness, i.e., at least weekly showers with soap and water and clothing changes (particularly underclothing).
3. Avoid overcrowding of personnel.
4. Instruct personnel on the detection and prevention of louse infestation.

Individual louse treatment measures include dusting with louse insecticide powder issued in a 2-ounce (56.7 g) shaker can.

For prevention or treatment of body louse infestations, wash all clothing and bedding in hot water and repeat in 7 to 10 days. If washing clothes is not practical because of travel or combat, application of an insecticidal dust is recommended. Dust the entire surface of the underwear and any other clothing worn next to the skin, including the shirt, as well as along the seams of outer garments. Rub the treated clothing lightly to spread the powder. About 30 g (1.07 oz) of insecticide per person is required. If clothing cannot be conveniently removed, unbutton the shirt and trousers and dust the powder liberally on the inside of the underwear or other garments next to the skin. Then pat the clothes by hand to ensure distribution of the powder. Toilet facilities, along with extra clothing and bedding, should also be dusted.

Insecticidal shampoos issued by physician prescriptions are the method of choice for the treatment of head and crab lice.

BEDBUGS.— Bedbugs are occasional pest aboard ship. They are not known vectors of human diseases, but they are annoying and can seriously affect morale. Bedbugs are approximately 1/5-inch long (5.1 mm), flat, reddish-brown insects with piercing and sucking mouth parts. They have nocturnal movement and feed only on blood. Their bite usually produces small, hard, white swellings (wheals). Habitual hiding places of bedbugs, such as the seams of mattresses, will often be obvious by the presence of dried black or brown excrement stains on surfaces where they congregate and rest. Their presence may also be indicated by blood stains on bedding.

For control of bedbugs, lightly apply the recommended insecticide to the sides and seams of all mattresses, which are best treated by folding and placing them in the center of the bunk at a 45° angle. Also treat other areas such as cracks and corners of bunks and empty lockers, springs, canvas bottoms and grommets, stanchions, and behind all equipment close to bulkheads. Bunks may be made up and occupied after 4 hours of ventilation following application. Complete control should be expected in 10 to 14 days.

COCKROACHES.— Cockroaches are the most common and persistently troublesome arthropod pest encountered indoors. They are among the most adaptable insects known and may be found in structures noted for high sanitary standards. Numerous pathogenic bacteria, viruses, and protozoa have been isolated from cockroaches and their feces. Because of their habits and close association with man, they are well-adapted for mechanical transmission of disease. Among the many different kinds of cockroaches that infest habitations are the German, American, and Australian cockroaches. They breed rapidly in the presence of food and warmth, shun the light, and are most active at night. During the day they tend to hide in cracks and other concealed places.

Cockroach infestations can be eliminated with high level sanitary measures coupled with a thorough chemical control program.

Active food preparation areas cannot be kept clean enough to eliminate existing cockroach populations by starvation; however, the following should be kept in mind:

1. Store food so it is inaccessible to cockroaches.
2. Place garbage and other refuse in containers with tight-fitting lids.
3. Thoroughly clean all food preparation areas, utensils, and equipment after each day's use.
4. Restrict food from berthing areas.
5. Cleanliness reduces available food for cockroaches. As the level of sanitation increases, the level of infestation decreases.
6. Conduct biweekly search and destroy programs. (Spray cracks and crevices with aerosol insecticides; if cockroaches appear, spray with the recommended insecticide.) Do not survey roaches on one day and treat identified sites on another day.

Prevent entry of cockroaches by inspecting ship's stores items such as bagged potatoes and onions, bottle cases, and food packages prior to storage or use; also inspect the contents of seabags. The elimination of harborages reduces insect populations, making the chemicals more effective.

Typical harborages include old and torn insulation; holes for plumbing and electrical lines as well as electrical switches and fuse boxes; areas between walls; areas behind drawers, oven hoods, under counters and serving lines; hollow areas in equipment and motor housings of refrigerators, mixers, milk machines, etc.

Effective chemical control goes hand in hand with sanitation. Check current instructions, especially NAVMEDCOMINST 6250.13 series, and your local preventive medicine unit or DVECC for recommended chemicals and application procedures. Residual applications should be made to cracks, crevices, and other harborages where cockroaches have been found during surveys. Create barriers by applying a band of insecticide residue around all areas (excluding food preparation areas) that cockroaches must cross to reach food or to travel from place to place. Use insecticide baits in fuse boxes, electrical outlets, around stoves, ovens, heaters, refrigeration units, food vending machines, behind false bulkheads, and in enclosed motor areas. Baits are used in all locations where liquids may cause electrical shorting or fires. If used properly, aerosols can also be very effective.

MITES.— Some mite species cause dermatitis in man and a few transmit scrub typhus, a severe and debilitating rickettsial disease endemic in some areas of the Far East (i.e., Japan).

Parasitic mites include the well-known scabies or itch mite. The scabies mite is transmitted by close body contact and may appear wherever social conditions cause excessive crowding of people. This mite burrows into the horny layer of the dermis, causing intense itching, especially at night.

Personnel operating in endemic scrub typhus areas where chiggers (larvae) constitute a health hazard should be required to use repellents and repellent-impregnated clothing. Locations that are to be used as camp sites should be prepared as fully as possible before the arrival of occupying units. Ensure that all vegetation is cut down or bulldozed to ground level and burned or hauled away. When troops must live or maneuver for periods of time in chigger-infested areas, it is recommended that area control with residual

applications of insecticides be accomplished. The effectiveness of any residual insecticide will vary with both the species of chigger and the area involved. Consequently, for adequate results, experimentation with materials and application rates may be necessary. Contact the area preventive medicine unit or DVECC for help or guidance.

Control measures for scabies or itch mites should be supervised by a medical officer. Control consists of treating infested individuals with a 1 percent gamma isomer of BHC (lindane) or other prescribed material and heat sterilization of clothing and bedding.

TICKS.— Ticks are annoying pests because of their bite and their ability to cause tick paralysis. They also are important vectors of infectious disease, including tularemia, Q fever, endemic relapsing fever, Rocky Mountain spotted fever, tick-borne typhus, and Colorado tick fever.

The two principal types of ticks are hard and soft ticks. The hard ticks are identifiable by their distinct hard dorsal covering. They attach themselves to their hosts during feeding and may remain there for a long time before engorgement is completed. The soft ticks lack the distinct hard dorsal covering. They hide in cracks and crevices in houses or in the nests of their hosts and come out at night to feed on the blood of the host for a short period. The larvae and nymphs generally feed several times before molting.

Protection from ticks begins with avoidance of infested areas whenever possible and wearing of protective clothing. High-top shoes, boots, leggings, or socks pulled up over the trouser cuffs help to prevent ticks from crawling onto the legs and body. At the end of the day, or more often, thoroughly inspect the body for attached ticks, making sure that none have migrated from infested to fresh clothing or bedding. This is critical as some species of hard ticks can cause paralysis, resulting in death, especially in small children when allowed to feed for prolonged periods.

Personal application of the standard-issue insect repellent is effective against ticks. Apply the repellent by drawing the mouth of the inverted bottle along the inside and outside of clothing openings. Treatments with 2 fluid ounces (59.15) of repellent per man per treatment have proved to be effective for 3 to 5 days. Impregnation of clothing with repellents is the method of choice for the protection of troops operating in tickinfested areas.

All ticks found on the body should be removed at once. The best method for removing attached

ticks is to coat them with Vaseline, baking powder paste, or clear nail polish. Care should be taken not to crush the tick or to break off the embedded mouth parts, which could be a source of infection. The wound should be treated with an antiseptic.

Clearing vegetation from infested areas will aid in the control of ticks and is recommended for bivouac and training grounds. All low vegetation should be uprooted with a bulldozer or cut and then burned or hauled away.

When troops must live or maneuver for periods of time in tick-infested zones, area control by residual application of sprays, dusts, or granules should be achieved. Residual treatments in living spaces are to made to infected areas only.

FLEAS.— Fleas are intimately connected with the transmission of disease, including bubonic plague and endemic or murine typhus. They are also the intermediate host of certain parasitic worms.

Fleas are ectoparasites of birds and mammals. The nest or burrow of the host is the breeding place and contains the egg, larva, pupa, and frequently the adult flea. Most fleas do not remain on their hosts continuously. Unlike most blood-sucking insects, fleas feed at frequent intervals, usually at least once a day.

Flea-infested areas should be avoided when possible. Protection can be afforded by wearing protective clothing or by rolling the socks up over the trouser cuffs to prevent fleas from jumping onto the skin. The application of standard-issue insect repellents is effective for short periods.

Transmission of plague and endemic or murine typhus may be controlled by applying insecticidal dusts to rat runs and harborage. If rodent control measures are to be undertaken when flea-borne diseases are prevalent, dust rat burrows before beginning rodent control to prevent fleas from leaving dead or trapped rats and migrating to humans or animals.

Control of dog and cat fleas can be obtained through the use of a dust or a spray applied directly to the animal. Area applications, for the control of dog and cat fleas, may be made using an emulsion.

RODENTS.— Rodents such as rats, mice, and ground squirrels are reservoirs for plague, endemic typhus, tularemia, and many other debilitating diseases. In addition, they can cause property damage and destruction. Rodents occur throughout the world; therefore, their control is a problem in any geographic location.

Generally, there are three species of common house rodents on the American mainland. Additional species occur in other areas of the world. The most important rodents from the medical and uxmomic viewpoint are the Norway or brown rat, the black roof rat, and the house mouse.

Rodent control programs should include elimination of food and shelter, rodent-proofing of structures, and active destruction of rodents by poisoning and trapping. Mice should be controlled by systemic trapping rather than poisoning because they nest indoors and will die in wall voids, etc., causing odor problems.

Poisoning should be regarded as supplementary to environmental sanitation and trapping; it becomes the method of choice (except for mice) once rodents are under control. Poisoning of rodents found aboard ships is not recommended due to odor problems; therefore, trapping is the method of choice when afloat. Proper sanitation, including garbage disposal, rat poisoning, harborage elimination, and food storage are of utmost importance in the permanent control of domestic rats and mice. Food storage structures should be completely rat-proofed. Stockpile supplies on elevatml platforms so that no concealed spaces exist. Garbage should be put in tightly covered cans that should be placed on concrete slabs or platforms. Surrounding areas should be carefully policed and garbage removed frequently. Open garbage dumps should not be tolerated.

When structures are built, all openings should be covered with 28-gauge, 3/8-inch (9.53 mm) mesh, galvanized hardware cloth; doors should be self-closing and tight-fitting, and those giving access to galleys and food-storage rooms should be equipped with metal flashing along the base. Walls and foundations should be of solid construction.

One of the most popular methods of killing rats is by the use of poisons. Resistance by rats and mice to the older anticoagulants, particularly warfarin, is well-documented in parts of Europe and the United States (contact the area DVECC or EPMU for advice), but where they are still effective they remain the method of choice. Rat poisons may be used alone or with water or food bait. The two most common species of rats have somewhat different food habits. Norway rats are more inclined to be meat and fish eaters; roof rats often prefer fruits and vegetables.

Anticoagulant rodenticides prevent blood clotting and cause capillary damage, leading in most cases to internal hemorrhage and death. At concentrations recommended for rodent control,

anticoagulant agents are not detectable or objectionable to rodents; but for effective control using warfarin based anticoagulants, they must be ingested several times. These feedings need not be on consecutive days but should occur within a 10- to 14-days interval. Adequate exposure to anticoagulant baits is contingent on the establishment of a sufficient number of protected bait traps. This can be accomplished by the use of properly constructed bait boxes. Baits can be protected by improvised means with locally available materials. Every container of poisoned bait must be labeled POISON with red paint in English and in the local language in non-English speaking areas. Bait stations should be inspected and replenished with fresh bait at weekly intervals.

Where rodent infestations occur, the use of poisoned bait, poisoned water, and traps, including glue boards, is recommended to obtain quick initial control. When traps are no longer useful, they should be removed but the baiting continued. This is appropriate especially in buildings where food is stored, prepared, or served, unless it is determined that the building is not vulnerable to reinfestation. In tropical and semi-tropical areas where rodent infestation is commonplace and not confined to buildings, area as well as building control must be used.

Premixed anticoagulant baits containing a rolled oat food base are obtainable from standard stock. If the food offered is not readily acceptable to the target rodent population, it may be necessary to test bait with additional food items. Cereal baits can be made more acceptable to rats by adding edible oil, peanut butter, and sugar. Test bait samples should be selected from three classes of foods known to be suitable bait. They include cereals (cornmeal, bread, mash, etc.) and fruits and vegetables (melons, bananas, sweet potatoes, etc.). It is important to use freshly prepared baits because rodents will reject stale or spoiled food.

Rat infestation in areas where water is scarce may often be controlled by using poisoned water. A water-soluble anticoagulant rodenticide is available from standard stock. Label instructions should be followed when using this item.

Rodenticide, Bait, Anticoagulant, FSN 6840-00-753-4973, is a ready-to-use type containing an anticoagulant chemical, rolled oats, and red dye, sugar, and mineral oil. This item is used directly from the container without further mixing.

The single dose rodenticides zinc phosphide and Maki, although surpassed in safety by

warfarin and other anticoagulants, may be required for effective control of warfarin resistant rats. These one-shot baits can be used more effectively by prebaiting. When rodents, especially rats, are well-fed and not especially hungry, prebaiting for 6 to 8 days gives better control than prebaiting for shorter periods. Warfarin and other older anticoagulant rodenticides are self-prebaiting, thus eliminating the need to change from unpoisoned to poisoned bait. The optimum mix for zinc phosphide is 0.2 ounces (7.7 g) to 1 pound (.45 kg) of bait. Carefully follow the label directions for Maki.

It is frequently necessary and desirable to supplement poisoning with trapping. The wood-base spring trap is the most effective type and should be used in adequate numbers. Traps should be tied to overhead pipes, beams, or wires, nailed to rafters, or otherwise secured wherever black greasy marks indicate runways. On the ground rodents normally run close to walls; consequently, the traps should be set at right angles to the rodent runways, with the trigger pans toward the bulkhead. Boxes and crates should be positioned to create passageways where rodents must travel over the traps. Although unbaited traps with the trigger pan enlarged with a piece of cardboard or lightweight metal may be used in narrow runways, trapping is usually more effective when accomplished with baited triggers. Preferred trap baits vary with the area and the species of rodents involved and include bacon rind, nuts, fresh coconut, peanut butter, raw vegetables, and bread or oatmeal dipped in bacon grease. Service all traps regularly to remove dead rodents and replace the bait. Use chain or wire to anchor the traps and to prevent a live rodent from dragging it away.

Fumigation will effectively destroy rat populations in their burrows and other hiding places. This procedure is carried out only when burrows are away from buildings. Where the fumigant can be confined, this method of control will also kill ectoparasites infesting the rats. After the fumigant is applied, the burrow openings should be tamped shut with dirt or sand. Fumigation for rat control should be conducted only by trained certified applicators.

Rat guards are used by naval vessels berthed in ports where plague is endemic to prevent rodents from entering the ship. After a ship leaves a plague-infected port, rat guards should be used at other foreign ports of call en route to the United States. Rat guards are not required but are recommended at foreign ports of call and in U.S. ports.

When the conveyance and cargo have been issued a quarantine preclearance in a retrograde cargo inspection program, rat guards are not required by quarantine even though the shipment may originate in a plagueendemic area.

Rodents are basically nocturnal. Therefore, gangways and landing ramps should be well-lighted at night to discourage rodents from moving aboard. Gangways and other means of access to the vessel shall be separated from the shore by at least 6 feet unless guarded to prevent rodent movement. Cargo nets and similar devices extending between the vessel and shore will be raised or removed when not in use.

Inspection of all subsistence items and cargo for sign of rodents, such as droppings, hair, gnawing, is essential in maintaining a rodent-free ship.

A current Certificate of Deratization or a Deratization Exemption Certificate is required for naval vessels. Requirements for this certificate are detailed in BUMEDINST 6250.7 series.

WATER SUPPLY ASHORE AND AFLOAT

A hygienically safe and continuously dependable water supply is one of the vital necessities of life. Water, like other natural resources, is procured as a raw material, manufactured into a commodity suitable for use, and distributed to places of consumption.

Drinking water must be free of disease-producing organisms, poisonous chemicals, and objectionable color, odor, or taste. All untreated water is considered unsafe until approved by a medical officer or his designated representative. Periodic laboratory examinations are required for all water supplies. See chapters 5 and 6 of the *Manual of Naval Preventive Medicine* for detailed information concerning water supply ashore and afloat. Chapter 9 discussed water supply in the field.

WATER SOURCES

A satisfactory water source is one with a natural supply of water large enough to supply all needs of using troops and of such quality that it can be readily treated with available equipment. Sources are classified as follows:

1. Rainwater: catchment.
2. Ground water: wells and springs.
3. Surface water: streams, ponds, lakes, and rivers.

4. Sea water; distillation and reverse osmosis.
5. Dew: condensation on cool surfaces.
6. Vegetation: coconut, wild pineapple, and cactus.
7. Snow and ice: heat.

WATER SUPPLY ASHORE

With rare exceptions, Navy and Marine Corps activities ashore within the continental limits of the United States are situated where a municipal water supply is available. The municipality is responsible for the delivery of water meeting minimum requirements of the National Interim Primary Drinking Water Regulations, which are enforced by the Environmental Protection Agency or the individual state that has been granted enforcement authority. National Interim Primary Drinking Water Regulations, however, have no requirements to deliver water containing a residual disinfectant; the Navy and Marine Corps will consider installation of a chlorination system for the supplied water (dechlorination) if an unhealthful situation exists. The military installation is responsible for the protection of the water during distribution through the system on its premises.

Unless a variance is obtained from a state with enforcement responsibility of the Environmental Protection Agency, all municipal systems (public water systems) in the United States must meet the quality standards of the Environmental Protection Agency and generally meet the requirements of National Secondary Drinking Water Regulations, which are not federally enforced and deal with the aesthetic qualities relating to the public acceptance of drinking water. All Navy and Marine Corps installations located outside the United States shall maintain the same drinking water standards as prescribed for U.S. installations; requests for deviation from these standards shall be submitted to Naval Medical Command through the area Navy Environmental and Preventive Medicine Unit.

FIELD DISINFECTION OF WATER

A hospital corpsman attached to a Marine unit or a naval construction battalion (SeaBees) may frequently be called upon to approve field water sources and to recommend disinfection methods before water is considered safe to drink. In a field situation, all water should be considered unsafe until it has been disinfected and tested. Approval of water sources should be based on a thorough surveillance of the situation, including the color,

odor, and turbidity of the water; the presence of vegetation of dead animals at the water point; and possible sources of pollution upstream. The hospital corpsman should seek out the best available water for the unit.

When safe water is not available, the following procedures may be used to produce potable water for either individual or group use.

CANTEEN WATER WITH IODINE TABLETS

1. Fill the canteen with the clearest, cleanest water available.
2. Check iodine tablets for physical change prior to use, as they lose their effectiveness in time. Iodine tablets that have become completely yellow (canary yellow) or completely brown should be discarded and not used. Those tablets that stick together or crumble should also be discarded.
3. Add 1 iodine tablet to a 1-quart canteen of water (add 2 tablets if the water is cloudy). An additional tablets should be added for each additional quart of water.
4. Replace the canteen cap loosely, wait 5 minutes, then agitate the canteen so that the threads around the neck of the canteen are rinsed.
5. Tighten the cap and wait an additional 20 minutes before using the water.

CANTEEN WATER WITH CALCIUM HYPOCHLORIDE AMPULES

1. Fill the canteen with the clearest, cleanest water available, leaving an air space of at least 1 inch below the neck of the canteen.
2. Add 1 ampule of calcium hypochloride to a canteen cup half full of water; stir with a clean stick until the powder is dissolved.
3. Fill the canteen cap one-half full of the solution in the cup and add it to the water in the canteen; place the cap on the canteen and thoroughly agitate. (If you are using a 1-quart aluminum canteen, add a minimum of 3 capsful of disinfectant solution to the canteen, as this cap is much smaller than the one on plastic canteens.)
4. Loosen the cap slightly; invert the canteen to allow the treated water to leak onto the threads around the canteen neck.
5. Tighten the cap and wait at least 30 minutes before using the water.

BOILING WATER

Boiling is used when disinfecting compounds are not available. It is a good method for killing disease producing organisms, but has several disadvantages.

1. Fuel is required.
2. It takes a long time for the water to boil and then to cool.
3. There is no residual protection against recontamination.
4. The water must be held at a rolling boil for at least 15 seconds to make it safe for drinking.

FIVE-GALLON WATER CANS

Five-gallon cans of water may be disinfected as follows:

1. Fill the 5-gallon can with the cleanest water available.
2. Check iodine tablets for physical change.
3. Dissolve 20 iodine tablets in a canteen cup full of water. Add this solution to the 5-gallon container and agitate the solution.
4. Place the cap on the container loosely; wait 5 minutes, then again agitate the container well.
5. Tighten the cap and wait an additional 20 minutes before using the water for any purpose.

Small Unit Water Treatment

When treated water is not available, small groups of personnel can treat an emergency water supply by chlorinating water in a Lyster Bag. Lyster Bags are 36-gallon containers issued to units on the basis of one bag per 100 men. The porous canvas, of which the bags are made, allows seepage of water and thus cooling by evaporation.

Unfortunately, the canvas is organic matter that has a chlorine demand of its own and makes it difficult to maintain adequate levels of chlorine. The bag is suspended from ropes or poles. Sagging can cause the outlets at the bottom of the bag to drop onto the ground below the bag. Should this occur, the rope should be adjusted so that the cover will again fit snugly around the upper part of the bag and the spigots will be at least 18 inches above ground level. Proper adjustment of the cover prevents contamination of the water by dust, dirt, and insects. The bag must be inspected

frequently for cleanliness and chlorine residual. If the bags are dirty, they should be scrubbed with water, disinfected, and thoroughly rinsed.

1. Fill the bag with the clearest water available.
2. Initially take 2 ampules of 65 to 70 percent calcium hypochloride (HTH) and pour the contents into a canteen cup. Add approximately 4 to 6 ounces of water to the cup and stir the solution thoroughly. Allow the solution to settle for several minutes (approximately 5 minutes) so the insoluble portion will settle to the bottom of the cup. Then stir the clear, supernatant liquid into the Lyster Bag.
3. Flush the faucets; wait 10 minutes, and collect the water sample. If it is less than a 5.0 ppm free available chlorine residual, repeat step 2 above.
4. Continue repeating the disinfection procedure until a 5.0 ppm residual is obtained after 30 minutes of contact time. The water is ready for use.

WATER SUPPLY AFLOAT

Potable water for shipboard use comes either from the sea through the ship's evaporators, from another ship, or from sources ashore. The ship's medical department is responsible for determining the quality of the water; the engineering section determines the quantity stored or produced and does the actual chlorination or bromination.

Free Available Chlorine (FAC)

Potable water obtained from an area where amebiasis or hepatitis is endemic must be chlorinated or brominated to obtain a 2.0 ppm residual in the tanks following a 30-minute contact period.

Water obtained from an approved source or distilled in open seas must be chlorinated to 0.2 ppm following a 30-minute contact period.

The free available chlorine level of a ship's water supply is checked by the Palin-DPD method. With this method, a tablet is placed in a small test tube filled with water. If chlorine (or bromine for ships having bromine disinfection) is present in the water, a color change will take place as the tablet dissolves. When the tablet is fully dissolved, the color of the sample is compared to color standards furnished with the kit. When a color match is obtained, the disinfectant

residual is read directly from amounts printed on the kit next to the color standards.

Calcium Hypochlorite

Calcium hypochlorite 65 to 70 percent (HTH) in 6-ounce plastic bottles is the only form of chlorine that may be carried aboard ships for disinfecting potable water.

Extreme caution must be observed in storing and handling calcium hypochlorite. Although this chemical itself is not combustible, it is a strong oxidizing agent and will react readily with organic materials such as paint, oil, solvents, and even wet garbage. In contact with these materials, calcium hypochlorite will produce large amounts of heat or fire and chlorine gas. Specific handling and storage precautions are contained in the NAVSHIPS Technical Manual, chapter 670.

Bacteriological Testing

In addition to being responsible for FAC determinations, the MDR is required to test the water at least weekly for bacterial content.

Bacteriological examinations should be carried out on samples collected from the tanks and at representative points throughout the ship's distribution system. The number of samples should be based on the size of the distribution system, but no less than four samples should be tested each week. Daily samples are collected following unsatisfactory results and are to be considered in addition to the routine weekly samples for record purposes. The steps for obtaining water samples are as follows:

1. Take chlorine reading with a calorimeter. Record in the ship's water log; if the sample is not tested aboard the ship, prepare a DD 686 to accompany the sample to the testing laboratory.
2. Let the water run for 2 to 3 minutes.
3. Collect sample. Take care not to contaminate the cap or top of the bottle.
4. Replace the cap. The sample is marked for identification and refrigerated if it is not to be tested immediately. If the sample is sent off the ship for testing, refrigerate it during transportation.

NOTE: DO NOT TAKE SAMPLES FROM LEAKING SPIGOTS.

There are currently two acceptable methods for testing the bacteriological quality of water. One is the multiple-tube fermentation procedure, which requires much laboratory preparation, physical space, and time. The other method is the membrane filter technique, which is the method of choice for bacteriological testing aboard ship. The membrane filter method uses the concept of filtering the water sample to trap any bacteria present in the water onto a thin membrane. The membrane is placed in a small petri dish containing a broth media, and the plate is then incubated for 24 hours at 35°C to see if bacterial colonies appear. Each bacterial colony that appears represents one bacterial cell present in the water sample.

If bacteriological testing reveals colonies with a greenishgold metallic sheen (coliform bacteria), fecal contamination of the water is indicated and the MDR must immediately institute corrective action in accordance with the *Manual of Naval Preventive Medicine*, chapter 6. If growth occurs but none of the colonies have the characteristic coloring, these colonies should be reported in the water log as "background colonies." Occasionally coliforms will not produce a metallic sheen; therefore, if consistent high counts of colonies without the metallic sheen are obtained, further examination of these background colonies is warranted. If no bacterial growth is noted, no action is required.

ICE

Ice intended for use in food or drink must be manufactured from potable water only and must be afforded the same sanitary considerations as other foods. Ice-making machines should be cleaned and inspected periodically by maintenance personnel to ensure proper operation. The MDR should be familiar with the operation of ice machines so that design and installation discrepancies that could lead to ice contamination will be recognized. For example, ice machine drain pipes should not be connected directly to a ship's drain line; there should be a space (air gap) between the machine drain pipe and the ship's receiving drain.

The Medical Department representative should include ice samples in weekly bacteriological analyses. This is accomplished by collecting ice in sterile containers, allowing the ice to melt, and then submitting the sample for membrane filter analysis for coliform bacteria.

REFERENCES

1. NAVMED P-5010, *Manual of Naval Preventive Medicine*.
2. NAVMED P-5038, *Control of Communicable Disease in Man*.
3. BUMEDINST 6230.1 series, Immunization Requirements and Procedures.
4. NAVMEDCOMNOTE 6230, Immunization Requirements for Active Duty and Reserve Navy and Marine Corps Personnel and Dependents.
5. NAVMEDCOMINST 6220.2, Disease Alert Reports.

